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Rev. 6

# Tank Farm Transfer Control Program & Pump Tank Transfer Jet Control Program

## Program Description Document

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## Summary of Revisions

02/03	Revision 0	
03/03	Revision 1	Revised output documents handling in Section 2.0. Added clarification on Evaporator overheads in Section 4.1. Deleted HDB-1 in Section 4.4. Deleted independent verification of SACs in Section 4.5. Added clarification for evaporator operations applicability throughout the document. Added Tank 40 Drain Valve Box Valve V-20 leak check exclusion in Section 5.5. Updated References.
06/03	Revision 2	Revised to delete item 6 on page 8, clarify second sound isolation point on page 12, clarify Tank 40 & 51 pump speeds to DWPF transfers on page 21 and add clarification of isolation device for dedicated power source on page 30.
11/03	Revision 3	Revised Section 4.7 to delete "from a postulated pipe break at the first above ground location" and add "system flow rate" on page 21.
01/04	Revision 4	Changes are made through out the document and identified with revision bars.
09/04	Revision 5	Revised Section 4.1 due to DSA update changes. Deleted FDB-1, FDB-5 and FDB-6 from Section 4.4. Added clarification wording in Section 4.18. Changed 12 hour frequency to shiftly in Sections 4.18 and 5.5. Added new section 5.6, DOE Manual 435.1-1 commitments. Deleted obsolete reference in Section 6.0. Added new reference to Section 6.0. Corrected typos and grammar throughout.
12/04	Revision 6	Revised Section 4.1 to modify the methods used in determining transfer type and corrected a reference number in action item 11. Revised Section 4.15 to require an engineering evaluation to attempt to re-zero the material balance discrepancy at half of the procedural limit and deleted storm water monitors from the discussion section. Deleted Section 4.18 in its entirety due to the approval of HLW-CRF-04008. Revised Section 4.34 to remove the referenced section of the Waste Characterization System PDD. Revised Section 5.2, part 5, to remove line 20E to comply with the TSR Administrative Control. Added new reference to section 6.0.

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## 1.0 SCOPE

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The scope of this Program Description Document (PDD) is to provide guidance to engineering personnel for implementing transfer related controls contained in the Documented Safety Analysis (DSA) programs and Technical Safety Requirements (TSR) Administrative Controls in transfer procedures and transfer evaluation and approval procedures. This document is not a Safety Basis document.

## 2.0 PURPOSE

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The purpose of this PDD is to provide background information and describe the attributes of the Concentration, Storage, and Transfer Facilities (CSTF) Transfer Control Program and Pump Tank Transfer Jet Control Program in sufficient detail such that these programs can be implemented. Also it will document implementation details of other commitments delineated in DSA/TSR Administrative Control Programs, Federal Facilities Agreement (FFA), Wastewater Permit, Price Anderson Amendments Act (PAAA), Authorization Agreement (AA), DOE Manual 435.1-1 and Best Management Practices (BMPs) related to waste transfers.

The output documents generated by this PDD shall ensure independent verification or validation of results and conclusions. Output documents include, but are not limited to, calculations, evaluations, procedures and technical reports.

Calculations issued as output documents shall be confirmed Type 1 calculations in accordance with the requirements of the E7 Manual, Procedure 2.31. Technical Reports issued as output documents shall comply with the requirements of E7 Manual, Procedure 3.60. Assumptions and recommendations from these reports shall be addressed in either the Design Authority Technical Review (DATR), waste transfer approval procedures or other evaluations performed against the proposed Waste Transfer.

Engineering evaluations issued as output documents shall be confirmed Type 2 calculations in accordance with the requirements of the E7 Manual, Procedure 2.31. These engineering evaluations may also be issued to the Document Control Center as drawings for retrievability in accordance with E7 Manual, Procedure 2.30.

Samples required in this document shall follow the methodology described in Reference 16.

### 3.0 Deleted

## 4.0 BACKGROUND / PROGRAM DESCRIPTION

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### 4.1 Transfer Type

#### ATTRIBUTE REQUIREMENT:

A determination of the type of transfer shall be performed. This evaluation will distinguish between HIGH-REM and LOW-REM WASTE TRANSFERS for all planned transfers.

DSA Chapter 3 "Hazard and Accident Analyses" used several waste streams such as Bounding Sludge Slurry, Evaporator Bottoms, Bounding Supernate, Static Tank Supernate, Slurried Type IV Tank to signify the material at risk on a per unit volume basis.

HIGH-REM WASTE TRANSFERS have an inhalation dose potential of greater than  $2.0\text{E}+08$  rem/gallon. Transfers of waste that have potential to exceed  $2.0\text{E}+08$  rem/gallon (e.g., transfers from H-Area Type I, II, III, and IIIA tanks that do not comply with TSR Administrative Control 5.8.2.19 and have not been sampled) shall be categorized as HIGH-REM WASTE TRANSFERS.

LOW-REM WASTE TRANSFERS have an inhalation dose potential of less than or equal to  $2.0\text{E}+08$  rem/gallon. Transfers out of H-Area Type I, II, III, and IIIA Tanks that implement TSR Administrative Control 5.8.2.19 (Sludge Carryover Minimization Program), transfers out of Type IV tanks, transfers of evaporator bottoms, and F-Area transfers (excluding SLUDGE SLURRY TRANSFERS out of Tanks 33 and 34) are categorized as LOW-REM WASTE TRANSFERS. For other CSTF initiated SLUDGE SLURRY TRANSFERS to be categorized as LOW-REM WASTE TRANSFERS, verification by sampling that the inhalation dose potential of the material is less than or equal to  $2.0\text{E}+08$  rem/gallon is required. Transfers from other facilities which have been shown to be less than or equal to  $2.0\text{E}+08$  rem/gallon by their Waste Compliance Plan (WCP) are categorized as LOW-REM WASTE TRANSFERS.

Accident Analyses are performed for both HIGH-REM and LOW-REM WASTE TRANSFERS and controls are established based on the type of waste transfer. Therefore, it is important to determine the type of waste transfer prior to implementing the applicable controls.

#### IMPLEMENTATION:

Reference 10 documented that all F-Area Tanks (supernate and sludge slurry with 16.7 wt% sludge solids concentration) with the exception of Tank 34 have inhalation dose potentials less than  $2.0\text{E}+08$  rem/gallon. For Tank 34 the required sludge concentration to reach  $2.0\text{E}+08$  rem/gallon is 10 wt% due to Am-241 process in F-Canyon between 1984 and 1989. There was some uncertainty that Am-241 may have been sent to Tank 33 during that time. Therefore, SLUDGE SLURRY TRANSFERS out of Tanks 33 and 34 are required to be verified less

than  $2.0\text{E}+08$  rem/gallon by sampling. All transfers out of F-Area Tanks are classified as LOW-REM WASTE TRANSFERS along with SLUDGE SLURRY TRANSFER verification requirements in Section 4.2.

All H-Area Tank supernate transfers that comply with the Sludge Carryover Minimization Program can be categorized as LOW-REM WASTE TRANSFERS. SLUDGE SLURRY TRANSFERS out of H-Area Type IV Tanks can be categorized as LOW-REM WASTE TRANSFERS. SLUDGE SLURRY TRANSFERS out of H-Area Type I, II, III, and IIIA Tanks shall be verified by sampling that the inhalation dose potential is less than or equal to  $2.0\text{E}+08$  rem/gallon to be categorized as LOW-REM WASTE TRANSFERS. Sampling is required only after initial complete slurring of the settled sludge. Sampling methodology described in Reference 16 shall be followed. The inhalation dose potential can be evaluated using one of the following sample analysis options:

1. Gross  $\alpha$  sample analysis result less than 0.2247 Ci/L. This value was derived in Reference 34 based on the bounding  $\beta$  value (from bounding sludge slurry) and bounding  $\gamma$  value (from bounding supernate),
2. Sample wt% sludge solids + Sample analysis for the isotopes listed in the DSA input
3. Sample wt% sludge solids + Bounding sludge slurry inhalation dose potential

If Waste Characterization System (WCS) reflects a sampled sludge slurry isotopic analysis results for these tanks, then WCS information is acceptable to use for categorizing as LOW-REM WASTE TRANSFERS.

In general pump tanks are used as intermediate waste transfer facilities for transfers within the Tank Farms, between F and H Tank Farms and receipt from outside facilities. Influent to the pump tanks from outside facilities will be controlled through Waste Acceptance Criteria (WAC) and Waste Compliance Plan (WCP). If a pump tank receives a HIGH-REM waste stream, transfers out of or through the pump tank shall be considered as a HIGH-REM WASTE TRANSFER until the pump tank is pumped down to the heel. During transfers through a pump tank, the inhalation dose potential of the waste stream leaving the pump tank is assumed to be the same as the inhalation dose potential of the material entering the pump tank (i.e., a LOW-REM WASTE TRANSFER to a pump tank would be considered a LOW-REM WASTE TRANSFER after leaving the pump tank). Refer to DSA Section 3.4.1.5.2 for details.

If actions are taken to mobilize the solids heel in a pump tank (e.g., installation of a new pump tank agitator), the transfer immediately after mobilizing the sludge through the pump tank shall be considered a High-Rem transfer after leaving the pump tank regardless of the inhalation dose potential of the waste stream entering the pump tank, due to the presence of newly mobilized solids (unless the pump tank material is confirmed not to be High-Rem via sampling).

Current facility configuration assumptions of F-area Tank Farm preclude a High-Rem transfer from being initiated within F-area Tank Farm. Facility modifications that could challenge these configuration assumptions (e.g., installing a new agitator in FPT 3) are required to be evaluated by the USQ process per Manual 11Q, procedure 1.05, which would ensure that a High-Rem transfer in F-area Tank Farm does not occur without proper safety basis changes and DOE approval.

Normally sumps collect the groundwater and rainwater in-leakage. Typically these sumps will be emptied into a pump tank or a waste tank and the transfer will be considered as a waste transfer (LOW-REM or HIGH-REM WASTE TRANSFER) unless the contents can be classified as a non-waste transfer as explained below.

Transfers from secondary containment sumps are considered to be WASTE TRANSFERS unless the sump contents have a sufficiently low inhalation dose potential that any release could not challenge the Evaluation Guidelines. Reference 23 evaluated HPP-4 sump sample results of total alpha =  $4.83\text{E}+03$  dpm/ml and total gamma =  $8.69\text{E}+05$  dpm/ml and material at risk of 15,000 gallons for non-waste transfer criteria and concluded that consequences for this material would be approximately 5 orders of magnitude less than the consequences reported in the DSA. Therefore, any sample results less than total alpha =  $4.83\text{E}+03$  dpm/ml, total gamma =  $8.69\text{E}+05$  dpm/ml and material volume less than 15,000 gallons can be considered as a non-waste transfer.

If the inhalation dose potential for the proposed transfer exceeds the above evaluated sample results, further evaluation of the sample can be performed to determine if the transfer can be classified as a non-waste transfer. The sample analysis can be compared to the applicable worst-case accident scenario described in the CSTF DSA for the inhalation dose potential, material at risk, and unmitigated onsite consequences for the transfer. To qualify the transfer as a non-waste transfer, the consequence analysis for the proposed transfer can be based on current realistic (less conservative) inputs/variables as compared to the inputs used in the accident analysis documented in the CSTF DSA. For example, the analysis can consider both the limited material at risk due to the smaller volume (limited by the size of the sump), and curie content of the transfer (typically slightly contaminated groundwater and rainwater). If the projected consequences are significantly less than the DSA consequences, the transfer is not considered a WASTE TRANSFER. If no samples are analyzed, or the sample analysis consequences when evaluated against the worst-case accident scenario documented in the DSA are not significantly lower than the DSA consequences, the contents shall be transferred either as a LOW-REM WASTE TRANSFER or HIGH-REM WASTE TRANSFER as explained below.

Sump transfers where the affected sump is considered a LEAK DETECTION LOCATION for a HIGH-REM WASTE TRANSFER, shall be considered a HIGH-REM WASTE TRANSFER under the following conditions:

1. Sump transfer is required while the HIGH-REM WASTE TRANSFER procedure is open, regardless of actual sump level.
2. Sump transfer is required after the HIGH-REM WASTE TRANSFER procedure is closed and the affected sump level exceeded the TSR LCO level limit (e.g., LCO 3.7.1, 3.7.2) while the HIGH-REM WASTE TRANSFER procedure was open.

Once the HIGH-REM WASTE TRANSFER procedure is closed, if the sump contents are sampled and verified to have an inhalation dose potential of less or equal to  $2.0E+08$  rem/gallon, the sump transfer can be considered as a LOW-REM WASTE TRANSFER. Additionally, if the affected sump level has been reduced below the TSR LCO level limit (with the HIGH-REM WASTE TRANSFER procedure closed), the subsequent sump transfer can be considered as a LOW-REM WASTE TRANSFER.

All other sump transfers, other than previously described, can be considered a LOW-REM WASTE TRANSFER.

The inhalation dose potential for Evaporator Bottoms in all three evaporators is always lower than the  $2.0E+08$  rem/gallon (LOW-REM) waste stream limit. Based on this, Evaporator transfer operations will be always considered as LOW-REM WASTE TRANSFERS and no verification is required.

Per DSA Section 3.4.2.17, consequences from the release of evaporator overheads tanks contents are judged to be negligible and no controls are required. Therefore, overheads are not considered as waste transfers.

Implementation Items:

1. Determine the transfer type (HIGH-REM or LOW-REM) for waste tank to waste tank transfers using WCS, sample results (as required), and Sludge Carryover Minimization Program requirements. Document the results in the transfer procedure during the procedure development and waste transfer evaluation and approval procedure prior to the transfer.
2. Verify the transfer type documented in the waste tank to waste tank transfer procedure is valid using the waste transfer evaluation and approval procedure prior to the transfer.
3. Limit the inhalation dose potential from outside facilities into FTF pump tanks to less than or equal to  $2.0E+08$  rem/gallon (LOW-REM) through the WAC/WCP.
4. Verify that the waste stream from outside facilities is approved per the ERD (Reference 29) prior to the transfer.
5. Normally the inhalation dose potential from outside facilities into HTF pump tanks is less than or equal to  $2.0E+08$  rem/gallon (LOW-REM)

through the WAC/WCP. If the inhalation dose potential is greater than 2.0E+08 rem/gallon (HIGH-REM) for H-Area pump tanks (i.e. the pump tank was in the TRANSFER PATH of a HIGH-REM transfer), transfer out of or through these pump tanks shall be considered as a HIGH-REM WASTE TRANSFER until it is pumped down to the heel. LOW-REM WASTE TRANSFER procedures from these pump tanks shall verify that no HIGH-REM waste stream has been received into the pump tank that would cause the transfer from the pump tank to be considered as a HIGH-REM WASTE TRANSFER.

6. Deleted.
7. Deleted.
8. Deleted.
9. Transfers from sumps that are considered as LEAK DETECTION LOCATIONS shall be designated as either a HIGH-REM WASTE TRANSFER, LOW-REM WASTE TRANSFER or a non-waste transfer based on the previously discussed criteria.
10. SLUDGE SLURRY TRANSFERS initiated in H-Area Type I, II, III, and IIIA Tanks shall be verified by sampling. The inhalation dose potential can be evaluated using one of the sampling analysis methods described in the implementation section and it shall be less than or equal to 2.0E+08 rem/gallon to categorize them as LOW-REM WASTE TRANSFERS.
11. Prior to the transfer, verify the applicable crane booms are controlled per Section 3.1 of Reference 19.
12. The first transfer immediately after actions are taken to mobilize the solids heel in a pump tank (e.g., installation of a new pump tank agitator) shall be considered a High-Rem transfer after leaving the pump tank regardless of the inhalation dose potential of the waste stream entering the pump tank unless the pump tank material is confirmed not to be High-Rem via sampling.

## 4.2 F-Area Tank Farm SLUDGE SLURRY TRANSFERS

### ATTRIBUTE REQUIREMENT:

F-Area Tank Farm SLUDGE SLURRY TRANSFERS shall be less than or equal to 16.7 wt% sludge solids. SLUDGE SLURRY TRANSFERS out of Tanks 33 and 34 shall be verified LOW-REM by sampling.

### IMPLEMENTATION:

When SLUDGE SLURRY TRANSFERS are planned for all F-Area Tank Farm Tanks except Tanks 33 and 34, sludge slurry wt% solids shall be verified to be less than or equal to 16.7 wt%. The verification can be based on either sample results after the slurrying prior to the transfer or calculations using the information in WCS. For SLUDGE SLURRY TRANSFERS out of Tanks 33 and 34, the inhalation dose potential shall be verified to be less than, or equal to,  $2.0\text{E}+08$  rem/gallon. The inhalation dose potential of  $2.0\text{E}+08$  rem/gallon was calculated for a 10 wt% slurry of Tank 34 material when the large quantity of Am-241 from the Rocky Flats Scrub Alloy campaigns was included (Reference 10). The large quantity of Am-241 contributed about 90% of the sludge slurry dose for the Tank 34 material. The Am-241 from Rocky Flats materials were derived based on accountability records, which have great accuracy and are not subject to much error. In addition, about 95% of the Rocky Flats scrub alloy material was attributed to Tank 34 which has a smaller sludge mass than Tank 33. Therefore, a reasonable limit to apply to Tank 34 during slurrying operations would be 8 wt% sludge solids in order to ensure  $2.0\text{E}+08$  rem/gallon is not exceeded. Since the amount of sludge in Tank 33 is more than twice the amount of sludge in Tank 34, a sludge slurry with 16 wt% sludge solids from Tank 33 would provide significant margin to prevent exceeding  $2.0\text{E}+08$  rem/gallon even if all the Am-241 from the Rocky Flats scrub alloy material were received into Tank 33 instead of Tank 34. The sample shall be performed after initial slurrying of the sludge inventory to be transferred. The results will be documented in the waste transfer evaluation and approval transfer procedure.

### Implementation Items:

1. Verify that F-Area Tank Farm SLUDGE SLURRY TRANSFERS out of all Tanks except 33 and 34 are less than or equal to 16.7 wt% sludge solids prior to the transfer.
2. Verify that SLUDGE SLURRY TRANSFERS out of Tanks 33 and 34 have inhalation dose potential less than or equal to  $2.0\text{E}+08$  rem/gallon by limiting sludge slurry solids wt% less than or equal to 16 and 8 wt% by sample respectively or by radiological sample analysis prior to the transfer.

### 4.3 Transfer Path

#### ATTRIBUTE REQUIREMENT:

A determination of the TRANSFER PATH shall be performed. Implementing procedures shall address identification of sound isolation points as part of TRANSFER PATH determination. This evaluation shall identify the necessary process area(s) and LEAK DETECTION LOCATIONS needed to support the transfer. This evaluation will also ensure the transfer line segments associated with the TRANSFER PATH and piping downstream of the isolation point (excluding segments designated as Out-of-Service) has acceptable integrity prior to initiating the transfer.

TRANSFER PATHS are established for the planned movement of waste through the transfer system (excluding the venting and draining of transfer lines where there is no potential to siphon waste). The TRANSFER PATH is defined as a combination of the transfer lines whose primary containment constitutes a continuous liquid transfer flow path. The TRANSFER PATH begins at the plane of the waste tank/pump tank/evaporator pot wall where the transfer line exits primary containment or at the jet for sump transfers. The TRANSFER PATH ends at the plane of the waste tank/pump tank/evaporator pot wall, where the transfer line enters primary containment. Waste tank primary containment includes tank risers sufficiently open to the waste tank such that they do not have the potential for pluggage and overflow. The TRANSFER PATH includes all piping branches up to the first sound isolation point (e.g., closed valve, blank, dummy Hanford connector). Transfer lines that are not Out-of-Service are assumed to maintain their primary containment function up to an acceptable waste location (e.g., waste tank, pump tank). As an example, a diversion box downstream of the first sound isolation point of the TRANSFER PATH is not considered a LEAK DETECTION LOCATION for the TRANSFER PATH. An additional requirement to the TRANSFER PATH determination is that for HIGH-REM WASTE TRANSFERS, valve boxes, drain valve boxes and the High Point Flush Pit (HPFP) shall be isolated from the TRANSFER PATH by a single leak-tested valve, sound double valve isolation or a blank OR identify them as LEAK DETECTION LOCATIONS. The reason for this requirement is that residual values are not monitored for valve boxes, drain valve boxes and the HPFP except when on the TRANSFER PATH during HIGH-REM WASTE TRANSFERS (consequences associated with LOW-REM WASTE TRANSFERS are acceptable).

It is recognized that jumpers and connectors within secondary containments (e.g., valve boxes, diversion boxes, tank risers) may experience minor leakage. As discussed in DSA Chapter 4, transfer line jumpers and connectors along a TRANSFER PATH are permitted to have "drip-wise" leakage. "Drip-wise" leakage shall not be a continuous flow of material or spray. "Drip-wise" leakage is not expected to challenge the sump inventory limits presented in Chapter 3 of the DSA within a 30-day period.

In certain LEAK DETECTION LOCATIONS, it is physically possible for a low flow-rate leak to drain out of the LEAK DETECTION LOCATION without accumulating sufficient depth of liquid to cause actuation of a credited leak detection device. In these cases, the potential downstream location for accumulation of the leaked waste will have the same leak detection requirements as the first LEAK DETECTION LOCATION.

An example of the above is FDB-3. This DB has a drain in the bottom of its sump, which directs waste to FDB-2. The drain in FDB-3 does not have a weir or similar device to ensure the accumulation of some minimal depth of liquid within FDB-3 before the liquid can drain to FDB-2. Thus, transfers through FDB-3 would require FDB-2 to be a LEAK DETECTION LOCATION.

Leak detection from a secondary containment is not considered and is not required per the DSA since it is a tertiary protection. As an example, leak detection box (MLDB-4) between FDB-3 and FDB-2 drain line is not required.

A further explanation for LEAK DETECTION LOCATIONS and the Safety Basis requirements placed on the locations is provided in Attachment-1, LEAK DETECTION LOCATIONS.

#### IMPLEMENTATION:

The TRANSFER PATH includes all piping branches up to the first sound isolation point (e.g., closed valve, blank, dummy Hanford connector). Blanks shall be qualified per ASME B31.3.

A primary containment waste location (waste tank, pump tank, evaporator pot) or another sound isolation point (e.g., closed valve, blank, dummy Hanford connector) downstream of the first sound isolation point shall also be identified. If the first sound isolation point is a blank, leak-tested valve or dummy Hanford connector, another sound isolation point or primary containment waste location is not required.

Only manually operated valves can be used for TRANSFER PATH determination since back-fit analysis (G-BFA-G-00034) was performed for manual valves only. However, if any pneumatic valves are seismically qualified for operability, it is acceptable to use them for TRANSFER PATH determination.

“Drip-wise” leak detection can be difficult if it is raining during the transfer due to rainwater intrusion. The Shift Manager and Shift Technical Engineer shall evaluate the conditions at the time (rate of increase in the secondary containment, transfer duration, etc.) and determine appropriate actions such as transfer shutdown, camera inspection, etc. The DSA did not credit structural integrity of evaporator system Jumpers in Evaporator Cells. Therefore, the drip-wise leakage limit is not applicable to evaporator operations.

DSA Section 3.4.1.5.2 lists inactive locations in which addition of waste into or waste transfers through are prohibited (transfers out are permitted). Waste transfers into these locations and waste transfers through lines for which the locations are LEAK DETECTION LOCATIONS are prohibited (waste transfers out of these locations are permitted). These inactive locations shall be isolated from waste transfers by a single leak-tested valve, sound double valve isolation, a blank, or a single sound isolation valve with justification.

FDB-1 nozzle 30 is single sound valve isolated in FPP-1 during transfers into FPT-1. The line segment connected to this nozzle is also tied to nozzle 1A in FPP-1. Within FPP-1, the current jumper configuration only provides single valve isolation (at two points - WTS-V-100 and WTS-V-101) between a jumper and Nozzle 1A (and therefore only single valve isolation from FDB-1). These valves can not be leak-tested without a significant modification to the transfer system. However, during transfers into FPT-1, the line downstream of these valves would not see significant pressure since the TRANSFER PATH will be open to FPT-1. Other factors that serve to reduce the overall risk include the following: 1) the only identified waste transfers that would make FDB-1 a single sound valve isolated path are non-routine waste transfers into FPT-1, 2) the size of FDB-1 (greater than 80,000 gallons) makes it improbable that a leak into the diversion box would go undetected prior to the box overflowing or reaching 100% of LFL if the leak accumulated in FDB-1, and 3) if the leak drained from FDB-1 to the F-Area Catch Tank, the size and underground location of the catch tank reduces the risk of a catch tank overflow or deflagration. Therefore, single sound valve isolation of FDB-1 during transfers into FPT-1 is acceptable.

Further TRANSFER PATH determination is not needed for the following evaporator transfer operations:

Evaporator feed from the feed tank to the evaporator pot.

Evaporator lift from the evaporator pot to the concentrate/vent tanks.

Evaporator cell sump to the evaporator feed tank.

The TRANSFER PATH for evaporator feed goes directly from the feed tank to the evaporator pot. The Evaporator lift TRANSFER PATH goes directly from the evaporator pot to the concentrate/vent tanks through the associated Gravity Drain Line (GDL). Steam and air supply to alternate lift is blanked off when it is not in use. The Evaporator cell sump jet TRANSFER PATH goes directly from the cell to the evaporator feed tank. For these TRANSFER PATHS all transfers are LOW-REM WASTE TRANSFERS (no LCO required LEAK DETECTION LOCATIONS), no other piping branches and no other primary containment acceptable waste locations in the path. Therefore no further TRANSFER PATH determination is needed for these transfers.

Following maintenance activities on a TRANSFER PATH component (valve, jumper, etc.) it may be necessary to transfer waste through the TRANSFER PATH instead of completing a leak test with water. It is acceptable to use waste

to perform the leak test for declaring the TRANSFER PATH component OPERABLE if operational controls are implemented to minimize the risk of the TRANSFER PATH component inoperability leading to an accident. This is accomplished by having a camera inspection of the locations being leak checked during the transfer. If a greater than 'drip-wise' leak is spotted, the transfer shall be immediately stopped. Since this is part of declaring the TRANSFER PATH component OPERABLE, it is not required to be reported in ORPS. These actions are in compliance with LCO 3.0.5 for returning inoperable equipment to service. Once the component has successfully passed the leak check, the TRANSFER PATH component may be considered OPERABLE.

The WASTE TRANSFER definition per TSR Section 1.2 is as follows.

"The planned movement of liquid waste along a TRANSFER PATH. This includes movement of waste caused by pumping, jetting, siphoning, or transfer jet/pump flushing activities (via jet entrainment or siphoning). If a transfer of water is known to have a waste siphon potential, the transfer shall be considered a WASTE TRANSFER.

A transfer that originated as a non-waste transfer (at the time of TRANSFER PATH determination) does not have to be revised to a WASTE TRANSFER as a result of picking up contamination along the transfer route. If a transfer of non-waste is known to have a waste siphon potential, the transfer shall be considered a WASTE TRANSFER.

Transfers from secondary containment sumps are considered to be WASTE TRANSFERS unless the sump contents have a sufficiently low inhalation dose potential that any release could not challenge the Evaluation Guidelines. Transfer out of sumps associated with the TRANSFER PATH of a HIGH-REM WASTE TRANSFER shall be assumed to be HIGH-REM WASTE TRANSFERS (unless the liquid is shown to have inhalation dose potential less than  $2.0E+08$  rem/gallon). Transfers out of these sumps at other times shall be assumed to be LOW-REM WASTE TRANSFERS, unless the sump contents have a sufficiently low inhalation dose potential that any release could not challenge the Evaluation Guidelines.

Activities such as removal of contaminated rainwater in-leakage or sampling from inactive locations (e.g., FDB-1, FDB-5, FDB-6, HDB-1, HPP-1, F-Area Catch Tank, 242-F/H Evaporators, F/H-Area Concentrate Transfer Systems, In-Tank Precipitation Filter Stripper Building, Tank 16) are not considered to be WASTE TRANSFERS.

Venting and draining of transfer lines where there is no potential to siphon waste is not considered a WASTE TRANSFER."

Simultaneous transfers with sound single valve isolation between them are permitted. This practice is acceptable since transfer events will be independently monitored by the material balance for each transfer.

Implementation Items:

1. Determine the TRANSFER PATH based on all piping branches up to the first sound isolation point (e.g., closed valve, blank, dummy Hanford connector). Also identify the primary waste containment waste location (e.g., waste tank, pump tank) or another sound isolation point downstream of the first sound isolation valve. If the first sound isolation point is a blank, leak-tested valve, or dummy Hanford connector, another sound isolation point or primary containment waste location is not required.
2. For HIGH-REM WASTE TRANSFERS, valve boxes, drain valve boxes and the HPFP shall be isolated by a single leak-tested valve, sound double valve isolation or a blank, OR identify them as LEAK DETECTION LOCATIONS.
3. All process areas and LEAK DETECTION LOCATIONS needed to support the transfer shall be identified. All identified leak locations shall comply with the requirements of transfer related LCOs 3.7.1, 3.7.2, 3.7.3, 3.7.4, 3.7.5, 3.7.7, 3.7.10, 3.7.11 and/or 3.8.6.
4. The transfer procedure shall include the line/segment/CLI numbers associated with the TRANSFER PATH and piping downstream of the first sound isolation point up to the second sound isolation point or process area. If the first sound isolation point is a blank, leak-tested valve, or dummy Hanford connector, line/segment/CLI numbers associated with piping downstream of the first sound isolation point are not required.
5. Verify the structural integrity (seismic qualification) of the transfer lines along the TRANSFER PATH and piping downstream of the first sound isolation point up to the second sound isolation point or process area using the CST Master Equipment List (MEL) or Asset and Information Management (AIM) database during the transfer procedure development. If the first sound isolation point is a blank, leak-tested valve, or dummy Hanford connector, verification of structural integrity of piping downstream of the first sound isolation point is not required.
6. Identify any excavations along the TRANSFER PATH and piping downstream of the first isolation point up to the primary waste containment location (e.g., waste tank, pump tank) or another sound isolation point prior to transfer and verify that the transfer lines in the excavation are evaluated for structural integrity and document the transfer lines are seismically qualified. If the first sound isolation point is a blank, leak-tested valve, or dummy Hanford connector, the identification of excavations downstream of the first sound isolation point is not required.
7. The transfer procedure shall verify that the line/segment/CLI numbers associated with the TRANSFER PATH and piping downstream of the first sound isolation point up to the second sound isolation point or process area

are tested as prescribed by the Structural Integrity Program (TSR AC 5.8.2.12) prior to initiating the transfer. If the first sound isolation point is a blank, leak-tested valve, or dummy Hanford connector, verification of line/segment/CLI numbers associated with piping downstream of the first sound isolation point is not required.

8. When FDB-3 is identified as a LEAK DETECTION LOCATION, FDB-2 and FPP-1 shall be also identified as LEAK DETECTION LOCATIONS since FDB-3 could drain to FDB-2 and FPP-1 prior to being detected in FDB-3.
9. When FDB-2 is identified as a LEAK DETECTION LOCATION, FPP-1 shall be also identified as LEAK DETECTION LOCATION since FDB-2 could drain to FPP-1 prior to being detected in FDB-2.
10. When HDB-2 is identified as a LEAK DETECTION LOCATION, HPP-3 shall be also identified as a LEAK DETECTION LOCATION since HDB-2 could drain to HPP-3 prior to being detected in HDB-2.
11. Deleted.
12. When a transfer line is designated as Out-of-Service, ensure that it is isolated from a waste TRANSFER PATH by a single leak-tested valve, sound double valve isolation, or a blank.
13. Deleted.
14. Inactive locations as specified in TSR Administrative Control 5.8.2.43.a shall be isolated from WASTE TRANSFERS by a single leak-tested valve, double sound isolation valve, a blank or a single sound isolation valve with a documented justification. FDB-1 can be isolated by a single sound valve during WASTE TRANSFERS into FPT-1.
15. When Tank 49 Valve Box is identified as a LEAK DETECTION LOCATION, the LDB Drain Cell shall be identified as a LEAK DETECTION LOCATION since Tank 49 Valve Box could drain to the LDB Drain Cell prior to being detected in Tank 49 Valve Box.

#### 4.4 Diversion Box Ventilation Requirements

##### ATTRIBUTE REQUIREMENT:

A determination of the Diversion Box (DB) ventilation requirements per DSA Section 3.4.2.10 shall be performed prior to jetting sump contents (inhalation dose potential is no greater than that of a LOW-REM WASTE TRANSFER).

DSA Section 3.4.2.10 deals with waste aerosolization event accident analysis. Various types of mixing and pumping devices are used to agitate waste inside of tanks and transfer waste from tank to tank. It is possible to generate aerosols as a result of pump failure, pump control failure, misalignment or mis-positioning of the pump, or a break in the discharge path of a pump. Additionally, various equipment used to transfer and agitate the waste use high-pressure steam and/or air sources. It is possible as a result of equipment malfunction or a break in a steam or air line that high-pressure steam or air will impinge on the liquid waste and generate aerosols.

Steam or air jet sparging can only occur in DBs that have installed steam jets. FDB-2, FDB-3, FDB-4, HDB-2 and HDB-3 either have a pump or a drain for removing residual liquid waste from their sumps and do not have steam jets. HDB-4, HDB-5, HDB-6, HDB-7, and HDB-8 have steam jets installed in their sumps.

The DB confinement and active ventilation with HEPA filter provide a mitigative control for both HIGH-REM and LOW-REM sump jet transfers. Not all DBs with sump jets have active ventilation systems (HDB-4 only has a passive HEPA vent and will credit only the HEPA and vent piping. HDB-5 has neither active nor passive ventilation systems and will credit only the DB confinement). Therefore, DB ventilation requirements are applicable to HDB-6, HDB-7 and HDB-8 only.

##### IMPLEMENTATION:

The Aerosolization Event credits HDB-6, HDB-7 and HDB-8 active ventilation system with HEPA filtration as mitigation for airborne releases from these diversion boxes. LCO's 3.7.5 (HDB-6), 3.7.6 (HDB-8) and 3.7.7 (HDB-7) address the ventilation requirements for HIGH-REM WASTE TRANSFERS (including HIGH-REM sump transfers). This section will address the LOW-REM sump transfers from HDB-6, HDB-7 and HDB-8.

If an installed ventilation system is not available for these DB's during the sump jet transfers, a portable ventilation system with a HEPA filter can be used. The portable HEPA filter shall comply with the HEPA Filter Program (TSR AC 5.8.2.18), Ventilation Systems Performance Monitoring (TSR AC 5.8.2.50) and HEPA filter efficiency requirements.

Implementation Items:

1. For HDB-6, HDB-7 and HDB-8 LOW-REM sump jet transfers, the transfer procedure shall verify that the ventilation system is running prior to initiating the sump jet transfer.
2. Deleted.

#### 4.5 Independent Verification of Correct TRANSFER PATH Alignment

##### ATTRIBUTE REQUIREMENT:

Independent Verification (IV) of correct TRANSFER PATH alignment (including verification of jet discharge path being open) shall be completed prior to initiation of the transfer. Use of correct motive force shall be independently verified after initiating the transfer.

DSA Section 3.4.1.5 states general CSTF inputs & assumptions and Section 3.4.1.5.6 lists the general controls required to protect general assumptions upon which the accident analyses calculations are based on. Independent verification of correct TRANSFER PATH alignment is one of the general controls listed in 3.4.1.5.6 and needs to be protected. The jet discharge path can be closed during water flushing of the jet.

##### IMPLEMENTATION:

This administrative control is applicable to all waste transfers.

TRANSFER PATH alignment verification can be performed by verifying valves are in the open position between the transferring location and receiving location. Sound isolation valves in the closed position in the TRANSFER PATH can be verified by reviewing System Alignment Checklists (SAC) since SAC's are independently verified. Independent verification can be performed by a second person (separated by time and distance), camera verification or peer verification.

Independent verification of correct motive force can be performed by a second person (separated by time and distance) or peer verification. Methods of independent verification can be prime-mover switch position, prime-mover "run" indicator light, level changes in transfer and/or receiving location, etc. Independent verification of motive force shall be performed for all waste transfers except in the case where the waste transfer is due to a siphon potential (flush water pumps during flushing, leak checking, etc.).

Sump transfers are short in duration and may not last long enough to be able to perform independent verification by a second person (separated by time and distance). Therefore, sump transfer motive force independent verification can be performed by the same person by verifying another parameter of the transfer such as level decrease from the sump or level increase in the receiving location, etc. If the verification can not be performed promptly, the sump transfer shall be stopped.

Independent verification of correct TRANSFER PATH alignment is not needed for the following evaporator transfer operations:

Evaporator feed from the feed tank to the evaporator pot.

Evaporator lift from the evaporator pot to the concentrate/vent tanks.  
Evaporator cell sump to the evaporator feed tank.

The TRANSFER PATH for evaporator feed goes directly from the feed tank to the evaporator pot. The Evaporator lift TRANSFER PATH goes directly from the evaporator pot to the concentrate/vent tanks through the associated Gravity Drain Line (GDL). Steam and air supply to alternate lift is blanked off when it is not in use. The Evaporator cell sump jet TRANSFER PATH goes directly from the cell to the evaporator feed tank. Also aerosolization events are not applicable to evaporator operations. For these TRANSFER PATHS all transfers are LOW-REM WASTE TRANSFERS (no LCO required LEAK DETECTION LOCATIONS), no other piping branches and no other primary containment acceptable waste locations in the path. Therefore independent verification of correct TRANSFER PATH alignment is not needed for these transfers.

Performing the independent verification of correct motive force within 30 minutes will ensure that the transfer error will be detected prior to reaching 15,000 gallons maximum missing waste.

Implementation Items:

1. Transfer procedures shall include IV of correct TRANSFER PATH alignment (e.g., valves in the open position between the transferring location and receiving location, sound isolation points in the TRANSFER PATH) prior to initiation of the transfer. This item is not required for evaporator transfer operations.
2. Transfer procedures shall include IV of starting of the correct motive force within 30 minutes of the transfer initiation.
3. Sump transfer verification can be performed by the same person by verifying another parameter such as sump level decrease, etc. If the verification can not be performed promptly, the sump transfer shall be stopped.

#### 4.6 Siphon Evaluation

##### ATTRIBUTE REQUIREMENT:

A siphon evaluation shall be performed prior to any liquid transfer. This evaluation will identify the potential for siphons and identify methods and equipment needed (including staging requirements) to stop siphons.

The transfer system in both H and F Tank Farms consists of transfer lines that interconnect waste tanks, pump tanks, diversion boxes, pump pits, and valve boxes. Due to changes in elevations (flow from higher level to a lower level) along a given transfer route, there is a potential for a siphon to occur after the prime mover is stopped (Reference 11). This can occur due to submerged inlet down-comers which have no vent opening above the liquid level or due to a submerged transfer jet or transfer pump which has either no siphon break or has a siphon break that may be plugged. Siphons may also occur to or from a leaking or left open single valve isolating tanks depending on the specific physical elevation and piping configuration.

When a siphon occurs, the Control Room Operator typically has no direct/automatic method to immediately stop the liquid movement. Generally, field work (e.g., closing a diversion box valve or loosening the jet connector) is required to stop or break the siphon. The time necessary to recognize a siphon is occurring, determine the appropriate method(s) to stop or break the siphon, obtain any necessary tools, and perform the necessary field work could result in waste being released above-ground. Therefore, it is necessary to include instructions for stopping and breaking the siphon in a procedure and to stage any required equipment.

##### IMPLEMENTATION:

All transfer routes with the exception of sump transfers and transfers out of the evaporators (with the feed pump secured), with a siphon potential shall have a valve in the siphon path available to stop the siphon liquid flow or a procedural contingency to break the siphon is required if a valve is not available. In addition to the valve that can stop the siphon, the capability to vent the siphon flow path at an elevation higher than the level in the tank being siphoned from (e.g., passive siphon break located at least 2" higher than the tank High Liquid Level Conductivity Probe (HLLCP) set-point, vent path to a vented location, ability to break the jet connector heads at both nozzles) is required to break the siphon. The methods to 1) stop, and/or 2) break, any potential siphon shall be identified in the siphon evaluation and specified in the transfer procedure. Any required equipment (e.g., valve T-handle, connector head wrench) shall be staged prior to the transfer and available during the transfer. Sump transfers and leak checks of jumper nozzle connections typically do not have valves to stop the siphon. Since sump transfers are small in volume, the sump transfer procedures can preclude siphon potential by other methods such as controlling the receiving tank levels

when a valve is not available. Transfers out of the evaporators (with the feed pump secured) are not initiators to a waste tank overflow accident and therefore do not require safety significant devices to stop the transfers and siphons. If a passive siphon break and a closed valve exist in the unintended path, it can be considered to have no siphon potential from that tank since it requires double failure of both the siphon break and the closed isolation valve to initiate the siphon. If a passive siphon break along with a closed isolation valve is used to eliminate the siphon potential, the siphon break location shall be at least 2" higher than the tank HLLCP set-point. Two inches above the HLLCP set-point will account for the set-point uncertainties. Pneumatic valves can only be identified to stop the siphon if they are seismically qualified for operability.

Implementation Items:

1. Perform and document the siphon evaluation for intended transfer.
2. Provide instructions in the transfer procedures to stop and/or break the siphon and to stage the equipment needed to stop/break the siphon as required.
3. If a passive siphon break along with a closed valve is used to eliminate the siphon potential from a tank, or is credited to vent and break a potential siphon from a tank, verify that the passive siphon break is located at least 2 inches above the HLLCP set-point.

#### 4.7 Overpressure Evaluation

##### ATTRIBUTE REQUIREMENT:

An over-pressurization evaluation (includes pluggage evaluation and variable frequency drive check prior to transfers if applicable) of the TRANSFER PATH shall be performed prior to any liquid transfer. This evaluation will identify the potential for over-pressurization and identify methods and equipment needed to prevent the identified potential.

Some of the transfer pumps are equipped with Variable Speed/Variable Frequency Drives (VSD/VFD) or Adjustable Frequency Drive (AFD). These drives could produce transfer line pressures higher than the design pressure of the transfer system piping, if the pump speed exceeds the maximum setting and the pump discharge is blocked. Therefore, an over-pressurization evaluation of the TRANSFER PATH shall be performed prior to any waste transfer involving VSD/VFD/AFD pumps. The evaluation shall determine the maximum pump speed setting to ensure the code allowable pressure for the transfer piping system is not exceeded.

Also pump speed shall be set to limit the system flow rate to 250 gallons per minute for waste tank pumps (except Tank 40 and 51 pumps to DWPF transfers) to meet the DSA Section 3.4.1.5.2 requirement of 15,000 gallons maximum missing waste and detection/response time of 60 minutes. Tanks 40 and 51 pumps flow rate shall be limited to 360 gallons per minute at the first above-ground break location since these pumps are used for limited volume batch transfers. The flow rate limit is not required for pump tanks due to limited volume of the pump tanks and incoming flow rates.

##### IMPLEMENTATION:

The following methodology shall be used for transfer system over-pressurization evaluation and maximum pump speed setting:

1. Determine ASME Code design pressure of the piping system.
2. Calculate maximum design pressure head in ft. based on the piping code pressure and pumped fluid and static head in ft. (elevation).
3. Calculate maximum pump speed (rpm) that develops pump shut-off head equal to the allowable design pressure head (ft) in item 2 using pump curves.
4. Calculate the pump speed to limit the maximum system flow rate to 250 gallons per minute for all waste tank transfer pumps (except Tank 40 and 51 pumps to DWPF transfers). For Tanks 40 and 51 transfer pumps to DWPF transfers, the pump speed shall be set to limit the maximum flow rate to 360 gallons per minute at the first above-ground break location.
5. For pump tank pumps, set the VFD/VSD/AFD maximum speed lower than the calculated maximum pump speed in item 3.

6. For waste tank transfer pumps, set the VFD/VSD/AFD maximum speed setting lower than the pump speeds calculated in items 3 and 4, whichever is smaller.
7. Verify that the VFD/VSD/AFD maximum speed setting is lower than the maximum pump speed in items 5 or 6 prior to the transfer.
8. Verify the VFD/VSD/AFD maximum speed setting by attempting to ramp up beyond the maximum speed (challenge test) prior to the transfer.
9. If the over-pressurization evaluation concludes that over-pressurization and maximum flow rate (if applicable) will not occur at any setting, then verification of VFD/VSD/AFD maximum speed setting is not required.

Implementation Items:

1. Over-pressure evaluation shall be performed for all intended liquid transfers using pumps.
2. Verify that the VFD/VSD/AFD maximum speed setting is lower than the over-pressurization or maximum flow rate (waste tanks) speed prior to the transfer (i.e., verification of VFD/VSD/AFD program maximum speed parameters).
3. Verify the VFD/VSD/AFD maximum speed setting by attempting to ramp up beyond the maximum speed (challenge test) prior to the transfer.

#### 4.8 Core Pipe Pluggage due to Salt Solids Formation

##### ATTRIBUTE REQUIREMENT:

For jet transfers out of a salt tank, an evaluation shall be performed to determine the possibility of core pipe pluggage due to salt solids formation if the transfer is shutdown (preventing aerosolization events). The evaluation shall include the amount of time the transfer may be suspended before flushing is required.

DSA Section 3.4.2.10 deals with aerosolization events. Certain programmatic controls governing waste transfers to prevent aerosolization events are credited as a safety class control. An evaluation of core pipe pluggage due to salt solids formation is required if the jet transfer out of a salt waste tank is performed. The evaluation shall include the maximum amount of elapsed time that the transfer may be suspended before flushing is required if pluggage is a possibility.

##### IMPLEMENTATION:

Salt-out evaluations will be performed for all waste tank jet transfers to assess the possibility of core pipe pluggage due to salt solids formation if the transfer is shutdown. The evaluation will be performed per the methodology outlined in Reference 26. The salt-out evaluation will be based on the conditions of the supernate in the sending tank (chemical composition and temperature). The solubility of major salt species in the sending tank supernate will be used to assess the potential for salt-out. If the potential for salt-out exists, heat transfer rates between the transfer line and its surroundings will be utilized in order to determine how long the transfer can be shutdown before flushing must be initiated.

This requirement is not applicable to sump jet transfers.

##### Implementation Items:

1. Perform a salt-out evaluation for jet transfers out of a salt waste tank to determine the potential for salt precipitation and core pipe pluggage potential.
2. If the evaluation determines that a pluggage potential exists for a jet transfer out of a waste tank, ensure that the transfer procedure includes the requirements identified by the evaluation.

#### 4.9 Water Hammer Evaluation

##### ATTRIBUTE REQUIREMENT:

An evaluation of water hammer potential shall be performed prior to any liquid transfer. This evaluation will identify the potential for water hammer and identify methods and equipment needed to prevent water hammer.

Waste handling in the CSTF requires multiple transfers of liquid solutions or slurries containing radioactive waste. Waste is transferred between various process areas through transfer facilities (e.g., DBs, VB, HPFP, Pump Tanks). During transfers, water hammer may occur and could damage the transfer line core piping. Core piping integrity is credited for various accident analyses. A water hammer evaluation shall be performed for all liquid transfers.

##### IMPLEMENTATION:

The methodology outlined in report M-ESR-S-00015 (Reference 30) or alternate engineering evaluation shall be used to determine the water hammer potential and any recommendations such as draining the transfer lines, high point venting and transfer pump start/restart criteria to prevent water hammer.

##### Implementation Items:

1. Perform and document the water hammer evaluation for the intended transfer consistent with the methodology in M-ESR-S-00015 (Reference 30) or alternate engineering evaluation.
2. Implement any actions such as draining the transfer lines, high point venting and transfer pump start/restart criteria identified in the water hammer evaluation to prevent the water hammer in the transfer procedures.

#### 4.10 Tank Riser Leak Detection

##### ATTRIBUTE REQUIREMENT:

An evaluation for tank riser leak detection shall be performed for the associated TRANSFER PATH for HIGH-REM WASTE TRANSFERS. This evaluation shall be based on the availability/adequacy of the tank riser drain (i.e., drain/riser design is such that the riser will not overflow even in the event of a complete line break). The identified LEAK DETECTION LOCATIONS shall comply with the requirements of LCO 3.7.10.

A loss of primary containment or incorrect transfer of waste could result in a transfer error event. The secondary containment identified in the Hazards Analysis as potential transfer error locations include waste tank annuli, DBs, VB, drain VB, PPs, catch tanks, the HPFP, LDB Drain Cell, waste tank transfer pump/jet risers, transfer line jackets, transfer line encasements, LDBs, MLDBs, and LPSs. Some waste tank transfer pump/jet risers are open at the bottom or have large drains, which excludes them from being potential transfer error locations. For these locations, a leak can be shown to not build up and plug the drain holes.

##### IMPLEMENTATION:

For HIGH-REM WASTE TRANSFERS, the waste tank transfer pump/jet risers that do not have adequate drain capacity shall be considered as LEAK DETECTION LOCATIONS and the leak detection equipment requirements of LCO 3.7.10 shall be followed. An evaluation of the drain adequacy shall be performed and documented. The evaluation shall ensure that the riser design will not allow the overflow even in the event of a complete line break in order to exclude it from being considered a LEAK DETECTION LOCATION. The methodology for the evaluation shall be that the calculated drainage flow rate be greater than the maximum pump/jet flow rate in the riser (examples: M-CLC-H-02172 for Tank 24 north riser, M-CLC-F-00688 for Tank 7 riser 4 and M-CLC-F-00790 for Tank 18 northeast riser).

##### Implementation Items:

1. When a tank jet/pump riser is in the TRANSFER PATH for a HIGH-REM WASTE TRANSFER, an evaluation shall be performed to determine whether it needs to be considered as a LEAK DETECTION LOCATION. If the riser shall be included as a LEAK DETECTION LOCATION for the HIGH-REM WASTE TRANSFER, it shall comply with the requirements of LCO 3.7.10.
2. If the evaluation in item 1 determines that the jet/pump riser is a LEAK DETECTION LOCATION for the HIGH-REM WASTE TRANSFER, the transfer procedure shall include the tank riser conductivity probe in accordance with LCO 3.7.10.

#### 4.11 Transfer Isolation Valve Evaluation

##### ATTRIBUTE REQUIREMENT:

Prior to each HIGH-REM WASTE TRANSFER, an evaluation of the associated transfer isolation valves shall be performed to ensure that the ability to stop transfers is maintained. If the isolation valve for a transfer has a Teflon seat, the evaluation shall include what, if any, additional measures need to be taken.

Waste handling in the CSTF requires multiple transfers of liquid solutions or slurries containing radioactive waste. Waste is transferred between various process areas through transfer facilities (e.g., DBs, VBs, HPFP, Pump Tanks). Each transfer may go through several valves in various process areas to get to the intended location. There could be multiple ways to isolate the transfer from events such as siphon, transfer error, overflow, etc. For a HIGH-REM WASTE TRANSFER, an evaluation of the selected isolation valve shall be performed to ensure that it will isolate the transfer as required. Some of the valves in Tank Farms have Teflon components such as valve seats. Teflon does not have a high radiation resistance and is thus subject to degradation in the presence of a sustained high radiation field. The Teflon in these valves can swell and crack to a degree that could prevent the valve from being manipulated to a closed position. If the selected valve has a Teflon seat, an evaluation shall be performed. This evaluation shall consider the material being transferred in terms of dose potential to the Teflon parts and the expected duration of the transfer. These two considerations would establish the expected integrated dose to the Teflon parts which could then be compared to the damage threshold exposure dose level for Teflon. If this threshold were challenged, then perform the following to bring the integrated dose below the threshold level:

1. Limit integrated dose by limiting the transfer volume or reduce the dose potential, OR
2. Pick a new transfer route, OR
3. Pick a different valve, OR
4. Replace the Teflon parts or the valve.

##### IMPLEMENTATION:

Transfer isolation valves are located in various transfer facilities (e.g., DBs, VBs, HPFP, Pump Pits). These valves shall be listed in the CST MEL database. The database shall identify which valves are equipped with teflon seats. If a Teflon seat valve is required for a HIGH-REM WASTE TRANSFER as an isolation valve, an evaluation will be performed and any compensatory measures required will be implemented.

Implementation Items:

1. For HIGH-REM WASTE TRANSFERS, identify the isolation valves to stop the flow to mitigate transfer events such as overflow or siphon.
2. If the required isolation valves for the HIGH-REM WASTE TRANSFER have Teflon seats, perform an evaluation for its acceptability and/or identify any compensatory/corrective measures.
3. Implement the compensatory/corrective measures identified in item 2.

#### 4.12 Second Isolation Device

##### ATTRIBUTE REQUIREMENT:

Prior to each HIGH-REM WASTE TRANSFER, procedures shall ensure that two isolation devices are sufficiently separated (by distance) such that the availability of one isolation device is maintained.

Section 4.14 of this Transfer Control Program requires an isolation device to stop the prime mover for all transfers. For HIGH-REM WASTE TRANSFERS, second isolation device is required. These two isolation devices shall be separated by distance to prevent inaccessibility during and after a seismic event.

##### IMPLEMENTATION:

In H-Area Tank Farm, there are multiple devices to stop the motive force of a transfer. Electrical power to the pump motors can be secured from various locations. There are numerous manual valves located in the field, which may be used for securing steam to a transfer jet.

The second isolation device shall be reasonably located away from the first isolation device to maintain accessibility of at least one of the devices as needed during and after a seismic event. The intent of a reasonable distance between the two isolation devices is to ensure the transfer can be shutdown when one of the devices could not be reached due to seismic event.

##### Implementation Items:

1. For a HIGH-REM WASTE TRANSFER, identify a second isolation device such as any power supply isolation for the transfer pump motor and any steam supply valve for the steam jets to stop the motive force. This second isolation device should be reasonably located away from the first isolation device.
2. Provide instructions in the HIGH-REM WASTE TRANSFER procedures to use the second isolation device to stop the motive force if the first isolation device fails to stop the motive force.

#### 4.13 Flushing the Core Pipe after SLUDGE SLURRY TRANSFERS

##### ATTRIBUTE REQUIREMENT:

Following SLUDGE SLURRY TRANSFERS and sludge slurry batches, a flush of the core pipe shall be performed. As a minimum, the program shall determine the necessary volume and duration to ensure the inhalation dose potential of the residual waste in the core pipe is less than or equal to that of bounding supernate (i.e., less than or equal to  $9.8\text{E}+07$  rem/gallon).

The flushing requirement is credited as a first level of control to reduce the onsite consequences of a core pipe explosion event. The flushing program is required only for SLUDGE SLURRY TRANSFERS due to their high concentration of solids which is the main contributor to source term. The waste stream involved is assumed to be supernate when the event is a mitigated transfer line explosion. Therefore, to protect the assumption, flushing is required after a SLUDGE SLURRY TRANSFER. However, if it is determined that the inhalation dose potential for the proposed SLUDGE SLURRY TRANSFER is less than  $9.8\text{E}+07$  rem/gallon, this program does not require flushing to further reduce the inhalation dose potential.

##### IMPLEMENTATION:

Flushing of transfer lines is required after a SLUDGE SLURRY TRANSFER. A supernate transfer after the SLUDGE SLURRY TRANSFER can be considered as the flush as long as the volume and duration requirements are met. If the SLUDGE SLURRY TRANSFER is a batch transfer, a single flush after the last sludge-slurry batch transfer is sufficient. The batch transfers shall not be separated by more than two weeks for the hydrogen buildup. However, if sludge-slurry settling criteria time is less than batch duration, the lower time limit shall be used for flushing requirements. Based on the recommendations of reports WSRC-RP-93-900-TL (Reference 31) and WSRC-RP-93-800 (Reference 32), three line volumes at a normal flush water system flow rate should dilute the slurry by 99%. Report WSRC-RP-93-800 (Reference 32) concludes that sludge-slurry will not plug the line if the settling time is less than a week.

This requirement is not applicable to the transfer lines owned by other facilities.

##### Implementation Items:

1. SLUDGE SLURRY TRANSFER procedures shall require the transfer lines be flushed with a minimum of three line volumes at the end of the transfer. The flushing shall be performed within a week after the transfer. If the transfer is a batch transfer, the next transfer of the batch or the flushing shall be performed within a week. If the SLUDGE SLURRY TRANSFER inhalation dose potential is less than or equal to  $9.8\text{E}+07$  rem/gallon, no flushing is required.
2. See Reference 17 (Corrosion Control PDD), Section 5, for additional requirements.

#### 4.14 Isolation Device to Stop the Transfer

##### ATTRIBUTE REQUIREMENT:

Prior to each waste transfer, a determination of the equipment needed to stop transfers shall be performed.

Most transfers are terminated from a control room panel or Distributed Control System (DCS). For a steam gang valve transfer, the motive force is secured when the valves in the field move from the "steam" or "jet" position into the "air" position. After the pipes routing from the gang valve to the jet are air blown, the valves move to the "vent" position. This valve manipulation secures the steam from the jet eductor. In addition to securing the transfer from the control room panel using the gang valve controls, there are numerous manual valves located in the field which may be used for securing steam to a transfer jet or evaporator lift.

For a transfer using a pump, the transfer is stopped when the electrical power to the pump motor is secured from the panel board or DCS. Electrical power to the pump motor can be secured from other locations if needed.

For an air-driven jet/pump transfer, the motive force is secured when the air supply valves are closed. Other non-credited methods of securing the air supply exist if needed.

For transfers that utilize a dedicated power source, the motive force is secured when the power source is secured (e.g., unplugging the power supply cord to an air compressor that supplies air to an air driven pump). If there is a reservoir between the compressor and the transfer pump, an evaluation shall be performed to ensure that the transfer will be stopped in a reasonable time. In this case, no specific equipment needs to be credited or identified.

For jets using water as motive force, the transfer can be secured when the flush water supply valves are closed.

##### IMPLEMENTATION:

The waste tank transfer jet gang valves have manual isolation valves in the steam supply and air supply systems located upstream of the gang valves and manual isolation valves located in the jet line downstream of the gang valves. Depending on the gang valve isolation valve configuration, either the upstream or downstream isolation valve(s) is used to isolate steam, flush water and air to the transfer jet. Selection of the isolation valves is based on operator accessibility and operation during accident and post seismic event conditions.

The transfer pumps and Evaporator feed pumps have various electrical components that can be used to manually interrupt electrical power to the motor. Dependent on the pump involved, either the electrical supply breaker to the motor

or the motor disconnect device is used as the device to interrupt electrical power to the pump motor.

Transfers out of the evaporators (with the feed pump secured) are not initiators to a waste tank overflow accident and therefore do not require safety significant devices to stop the transfers and siphons.

If a transfer jet gang valve discharge isolation valve is identified to stop the transfer, it will stop all motive forces (steam, air and water). If a steam isolation valve is identified to stop the transfer, it is possible to have air lift of the waste if air leaks through and proper elevations exist. For this condition, both steam and air isolation valves (including bypass valves if present) shall be identified to stop the transfer.

The manual cycling of the credited valves shall consist of fully closing the valve and then fully opening it. This exercise of the valve ensures that the valve is not frozen and therefore able to be closed if required.

Implementation Items:

1. Identify the isolation valve credited to stop steam, air or flush water flow to transfer jets (including evaporator lift gang valves) in the transfer procedure and verify that it is in service prior to transfer. If the steam isolation valve is identified as a credited valve, an air isolation valve must also be identified.
2. Identify the electrical isolation device credited to stop transfer pumps in the transfer procedure and verify that it is in service prior to transfer.
3. Identify the isolation valve credited to stop air flow to air-driven transfer jets/pumps (including evaporator lift gang valves) in the transfer procedure and verify that it is in service prior to transfer.
4. Transfer procedures shall ensure that the credited valves identified in implementation items 1 and 3 are manually cycled prior to the transfer.

#### 4.15 Transfer Monitoring

##### ATTRIBUTE REQUIREMENT:

Waste transfers shall be monitored periodically for indications of transfer events (i.e., transfer error, siphoning, leakage). Monitoring shall extend beyond the TRANSFER PATH to locations (e.g., pump tanks, waste tanks) determined by evaluation. The evaluation to determine the monitoring locations beyond the TRANSFER PATH shall consider the isolation method used to define the TRANSFER PATH (e.g., non-leak checked valve versus leak-checked valve, double valve isolated, blanked). Material balances shall also be performed. The frequency and method for both level/leak monitoring and material balances for a transfer shall be determined on an individual basis and shall be commensurate with the transfer rate and transfer type (batch versus continuous). In general, increased monitoring frequency is appropriate during the initial stages of the transfer, with a lesser frequency required once a transfer has been established.

During waste transfers, leaks and spills can be detected by numerous instruments in the facilities. Available instruments include reel tapes, Area Radiation Monitors (ARMs), Continuous Air Monitors, dip tubes, and conductivity probes (not all of these features may be present to detect waste in each location). These instruments shall be included in the transfer procedure as applicable. Other methods can be used to monitor for indications of transfer events. These methods include insertion of a video camera in the waste tank, using a reel tape to monitor tank level, parking a reel tape above the waste surface, etc. The different circumstances of each individual transfer shall be evaluated to determine which method is most effective.

In addition to level/leak monitoring above, material balances shall be performed as another means of detecting transfer events. The material balance cumulative difference may be reset to zero during the transfer or following a shutdown if the documented engineering evaluation is completed.

##### IMPLEMENTATION:

Waste transfers shall be monitored periodically for indication of transfer events often enough such that a leak of 15,000 gallons would be detected. A material balance shall be performed for all waste transfers with a potential volume of > 15,000 gallons (including siphon potential) with the exception of evaporator transfer operations as defined in Section 4.3 of this PDD. Material balance tolerances shall be prescribed in the transfer procedures. Small volume transfers from pump tanks to waste tanks should have a reasonably small material balance tolerance. Large volume transfers from a waste tank through numerous pump tanks and finally to another waste tank would most likely have a relatively large material balance tolerance. For this reason, each transfer or grouping of transfers shall prescribe an acceptable material balance tolerance in the transfer procedure. The Shift Manager, Shift Supervisor, and/or Shift

Technical Engineer shall use this tolerance for determining if a transfer is being routed successfully.

A material balance discrepancy should be compared with other process data as well as the trend of the previous discrepancies during the same transfer, and consider the system flow rate and material balance frequency, to ensure the transfer is shutdown before the DSA maximum missing waste volume is exceeded. Resetting the cumulative material balance difference, during the transfer or following a shutdown, must be evaluated and approved with a documented engineering evaluation. This evaluation can be in the form of a position paper, engineering numbered memo or included as part of the transfer procedure. Approval for resetting to zero must be obtained from the Facility Manager or his designee. The evaluation should consider items such as validity of transfer data, functionality of instruments being used (reel tapes, bubblers, etc.), calculation errors, transfer line hold ups, jet dilution estimates, evaporator operational parameter changes (feed rate, lift rate), salt mounds, salt on cooling coils, material balance of concurrent transfer that is single valve isolated, conical sections of Type III/IIIA Tanks (>299"), unexplainable level changes in other process areas, etc. If the material balance discrepancy reaches 50% of the procedure limit, an engineering evaluation shall be performed to attempt to re-zero the material balance. If this evaluation cannot support re-zeroing of the material balance discrepancy, the transfer does NOT have to be shutdown at 50% of the procedure limit. The material balance discrepancy shutdown criteria approved for the transfer procedure remains in effect and will continue to protect maximum missing waste assumptions of the DSA.

The frequency of the material balance is dependent on transfer rate (jet transfer vs. pump transfer) and type of transfer (batch vs. continuous). For jet transfers the average transfer rate is less than 100 gpm and pump tank transfer rate is 125 gpm. Most of the transfers are limited by either jet or pump tank transfer rates. Based on these transfer rates, a material balance shall be performed every 2 hours. Material balance frequency for a waste tank to waste tank pump transfer without a pump tank shall be determined on a case by case basis. Also, the frequency of the material balances should be more often during the initial stages of the transfer when transfer events are more likely to occur and less frequently after the transfer is established. For short duration transfers (e.g., less than 1 hour) the material balance can be performed at the completion of the transfer. Different material balance frequencies for a specific transfer can be prescribed with an engineering justification.

For Inter Area Line (IAL) transfers, the first material balance can be performed after a level increase in the receipt tank (it may take longer than 1 hour due to number of pump tanks and transfer lines involved). Since IAL transfers normally start with water to verify the transfer route, it is acceptable to perform the first material balance 2 hours after start of the transfer.

Evaporator transfer operations TRANSFER PATHS are dedicated to specific locations without going through any pump tanks, diversion boxes, valve boxes or drain valve boxes. TRANSFER PATH for evaporator feed goes directly from feed tank to the evaporator pot. Evaporator lift TRANSFER PATH goes directly from evaporator pot to concentrate/vent tanks through the associated GDL. Steam and air supply to alternate lift is blanked off when it is not in use. Evaporator cell sump jet TRANSFER PATH goes directly from cell to evaporator feed tank. Therefore, transfer events are minimized for these evaporator transfer operations and material balances are not required for these TRANSFER PATHS. However, during evaporator operations, feed and concentrate tank levels are monitored periodically for level changes.

Material balance need not be performed during the temporary shutdown of the transfer provided that one is performed after the prime mover is stopped.

Waste tank levels using reel tapes may not be accurate if slurry pumps/mixers are in operation. Means of obtaining an accurate material balance may include stopping the slurry pumps/mixers to get the reel tape readings or establishing another method of obtaining material balance with slurry pumps/mixers in operation.

When securing the transfer, the expected drain back volume (in gallons or inches of tank level) shall be specified in the transfer procedure to aid in determining transfer events such as siphoning, line pluggage, equipment malfunctioning (closed/partially closed valve), etc.

#### Implementation Items:

1. Record TRANSFER PATH tank levels (waste tanks and pump tanks) every 30 minutes for the first 2 hours of the transfer and every 2 hours thereafter in the transfer procedure. Record the final levels at the end of the transfer. This is not applicable to evaporator transfer operations.
2. Record sump levels and single valve isolated path tank levels (waste tanks and pump tanks) every 30 minutes for the first 2 hours and every 12 hours thereafter in the transfer procedure. Record final levels at the end of the transfer.
3. Perform a material balance for waste transfers with a potential volume of > 15,000 gallons every hour for the first 2 hours of the transfer and every 2 hours thereafter. Also perform a final material balance at the shutdown of the transfer. The material balance frequency may be varied for unusual transfers (e.g., interstitial liquid removal, IAL transfers) depending on transfer rate and type of transfer etc.
4. For a short duration transfer (e.g., less than 1 hour), the material balance can be performed at the completion of the transfer.

5. Deleted.
6. When securing the transfer, the expected drain back volume (in gallons or inches of tank level) shall be specified in the transfer procedure. During the transfer shutdown, levels shall be monitored for the expected drain back and if the expected drain back is not received, the Shift Manager or his designee shall be notified for appropriate actions.
7. Transfer procedures shall verify that equipment used for transfer monitoring is functional prior to the transfer.
8. Material balance cumulative difference can be reset to zero at any time during the transfer or following a shutdown if a documented engineering evaluation is completed and approved by the Facility Manager or his designee. If the material balance discrepancy reaches 50% of the procedure limit, an engineering evaluation shall be performed to attempt to re-zero the material balance.
9. During evaporator operations, feed and concentrate tank levels shall be monitored periodically (round sheets) for level changes.

#### 4.16 Flammability Control Program Assumptions

##### ATTRIBUTE REQUIREMENT:

It shall be verified that waste transfers to the waste tanks are within the requirements of the Flammability Control Program.

The radioactive aqueous wastes stored in the waste storage tanks may release flammable vapors into the waste tank vapor space. Hydrogen released during the radiolytic decomposition of water from waste is the primary flammable vapor of concern. Dissolved hydrogen and small quantities of flammable organics may also be released from the waste.

##### IMPLEMENTATION:

The Flammability Control Program protects the assumed times to LFL in individual waste tanks, thereby preventing a waste tank explosion. Flammability Control Program requirements are listed in Reference 14. Waste transfers into and out of waste tanks will affect the time to LFL of the transferring and receiving tank due to type of waste and the amount of waste being transferred. The Transfer Control Program shall ensure that the Flammability Control Program assumptions are protected.

##### Implementation Items:

1. Verify that transfer procedures (including the waste transfer evaluation and approval procedure) include the items prescribed by the Flammability Control Program, Program Description Document (Reference 14).

#### 4.17 Waste Tank Space Availability

##### ATTRIBUTE REQUIREMENT:

Prior to each waste transfer, verification of available waste tank space shall be performed.

##### IMPLEMENTATION:

Waste tank liquid level is required to be less than or equal to tank specific fill limits specified in the ERD (Reference 29). Therefore, by verifying the receiving waste tank expected maximum final level is lower than HLLCP setpoint prior to the transfer will ensure that the tank specific fill limit is not exceeded.

##### Implementation Item:

1. Verify that the receiving waste tank expected maximum final level is lower than the HLLCP set-point from the ERD (Reference 29) prior to the transfer and document in the waste transfer evaluation and approval procedure.
2. Verify that transfer procedure directs shutdown of the transfer prior to reaching the approved volume identified in the waste transfer evaluation and approval procedure.

#### 4.18 Storm Water System

Deleted

#### 4.19 Pump Tank Space for Canyon Transfers

##### ATTRIBUTE REQUIREMENT:

The Canyon receipt pump tank can receive the entire transfer volume without overflowing the pump tank.

DSA Section 3.4.2.18.1 Seismic Event for the transfer error scenario assumed that the receipt pump tank from the Canyon transfer could receive the entire transfer volume without overflowing the pump tank. This assumption shall be protected.

##### IMPLEMENTATION:

Normally Canyon transfers are received as a batch transfers into pump tanks. Prior to accepting the transfer from the Canyon, the operator shall verify that the transfer volume will be less than pump tank available volume. However, if the Canyon transfer is a continuous transfer and if the transfer pump stops or fails to start during the transfer, the operator shall notify the Canyon operator to stop the transfer. Based on the Canyon header operating level and the Canyon transfers being gravity drained (open channel flow), the drain back volume from the Canyon transfer lines will be less than the volume needed to overflow the pump tank if the Canyon transfer is stopped immediately after the pump failure.

##### Implementation Items:

1. If the Canyon transfer is a batch transfer, verify that the amount of waste to be received will not overflow the pump tank prior to the transfer.
2. If the Canyon transfer is a continuous transfer and if the pump tank pump stops or fails to start during the transfer, shutdown the transfer from the Canyon immediately.

#### 4.20 Pump Tank Transfer Jet Control (TSR 5.8.2.36)

##### ATTRIBUTE REQUIREMENT:

Programmatic controls shall be established to ensure that steam/air is manually isolated from pump tank transfer jets when not transferring. Proper valve line-up of the jet transfer discharge path will be performed via the Transfer Control Program.

The amount of airborne material at any location containing liquid waste is related to the conditions of the waste (e.g., waste temperature, surface area, ventilation flow, and available vapor volume). In addition, anticipated normal operations and process upsets could disturb liquid waste and cause an increase in the airborne component of wastes in the CSTF. Some waste disturbances (e.g., normal waste transfers) can cause minor waste splashing but do not result in a significant increase in airborne material and are not considered accidents, as documented in the Hazard Analysis. Other intended and unintended waste disturbances (e.g., agitation, sparging, stripping) could result in a more significant airborne material release due to increased splashing or spraying.

Various equipment used to transfer and agitate the waste uses high-pressure steam and/or air sources. It is possible as a result of equipment malfunction or a break in a steam or air line that high-pressure steam or air will impinge on the liquid waste and generate aerosols. Most of the aerosolization events involve liquid jet impingement, steam jet impingement or air jet impingement. Pump tank aerosolization events due to transfer jet impingement are prevented by isolating the pump tank transfer jet when not in use and jet discharge path valve position independent verification when the jet is in use.

##### IMPLEMENTATION:

This administrative control is credited as a Safety Class control to prevent pump tank aerosolization event. In the Tank Farms, FPT-2, FPT-3, HPT-2, HPT-3, HPT-4, HPT-5, HPT-6, HPT-8, HPT-9 and HPT-10 are equipped with steam jets. A manual valve between the steam/air supply and the transfer jet for each pump tank will be identified as the isolation valve to prevent steam/air entering the pump tank when not using the jet for transfer. The isolation valve will be closed upon completion of the transfer. Also whenever these identified valves have been manipulated for other reasons (e.g., maintenance, surveillance), an alternate valve(s) shall be closed prior to the manipulation of the identified valve. Jet discharge path valve position verification prior to the transfer will be performed per Section 4.5 of this PDD.

Implementation Items:

1. Deleted.
2. Ensure that the pump tank transfer jet gang valve discharge isolation valve is closed after the transfer completion.
3. Ensure that the pump tank transfer jet gang valve discharge isolation valve is independently verified in the closed position.
4. Ensure alternate valve(s) is closed and Independently Verified prior to manipulation of the pump tank transfer jet gang valve, discharge isolation valve for other activities which require manipulation of the valve. The alternate valve(s) shall isolate both steam and air supplies to the jet.

#### 4.21 Hydrogen Generation Rate Control (TSR 5.8.2.31)

##### ATTRIBUTE REQUIREMENT:

Programmatic controls shall be established to ensure that the hydrogen generation rates for waste in the facility are within the bounding values used in the safety analysis for the applicable locations.

DSA Section 3.4.1.5.5 listed the hydrogen generation rates used in the various accident events and residual calculations. The programmatic controls shall ensure that transferring materials are within these hydrogen generation rates to protect the assumptions.

##### IMPLEMENTATION:

Transferring waste from tank to tank, adding a large quantity of water to a waste tank, and removing supernate from a waste tank could change the hydrogen generation rate. An evaluation shall be performed prior to these activities to ensure that the hydrogen generation rates are within the assumed values. Evaporator bottoms hydrogen generation requirements are addressed in Evaporator Feed Qualification Program Description Document (Reference 15). Hydrogen generation rates shall be obtained from WCS.

##### Implementation Items:

1. Verify that sludge slurry material hydrogen generation rate is less than or equal to  $1.5\text{E-}5$  ft<sup>3</sup>/hour-gal prior to the transfer and document in the waste transfer evaluation and approval procedure.
2. Verify that supernate material hydrogen generation rate is less than or equal to  $9.6\text{E-}6$  ft<sup>3</sup>/hour-gal prior to the transfer and document in the waste transfer evaluation and approval procedure.
3. Verify that the resulting hydrogen generation rate in the Type IV Tank will be less than or equal to  $2.6\text{E-}6$  ft<sup>3</sup>/hour-gal prior to the transfer into a Type IV Tank and document in the waste transfer evaluation and approval procedure.
4. Verify that the hydrogen generation rate of the material transferring through Type I and Type II Tanks annuli is less than or equal to  $5.6\text{E-}6$  ft<sup>3</sup>/hour-gal prior to the transfer and document in the waste transfer evaluation and approval procedure.
5. Verify that the hydrogen generation rate of the transfer material going through Valve Box 15/16 is less than or equal to  $9.6\text{E-}6$  ft<sup>3</sup>/hour-gal prior to the transfer and document in the waste transfer evaluation and approval procedure.

#### 4.22 ARM Location Program (TSR 5.8.2.41)

##### ATTRIBUTE REQUIREMENT:

Programmatic controls shall be implemented during HIGH-REM WASTE TRANSFERS to ensure the placement of ARMs for above-ground waste transfer lines (including excavated transfer lines) for leak detection purposes. The program shall also determine the alarm requirements (e.g., control room alarm or local alarm and operator/control room two-way communication) for each ARM. The ARMs shall comply with LCO 3.7.9.

DSA Section 3.4.2.9 "Transfer Error" accident analysis credits ARMs for all above-ground leak locations (including excavation locations) as a second level of control during HIGH-REM WASTE TRANSFERS. The detection capability of the ARM devices is sensitive to the radionuclide distribution. Therefore, an evaluation shall be performed prior to HIGH-REM WASTE TRANSFERS to determine the proper placement of the ARMs to ensure that they can perform their intended safety function. The program shall consider appropriate transfer specific parameters (e.g., Cs-137 concentration, shielding obstructions between leak locations and monitoring locations) when determining ARM placement. The program shall also determine the alarm requirements (control room alarm or local alarm and operator/control room two-way communication) for each ARM. The ARMs shall comply with LCO 3.7.9. LCO 3.7.9 is applicable to above-ground transfer lines in the TRANSFER PATH. Above-ground transfer lines include those transfer lines designed to be permanently above-ground, and also transfer lines that are temporarily exposed due to excavations.

##### IMPLEMENTATION:

An evaluation shall be performed prior to HIGH-REM WASTE TRANSFERS to identify the ARM locations for above-ground transfer lines and exposed transfer lines in excavations. The evaluation shall be performed per the approved methodology in Reference 13.

##### Implementation Items:

1. For HIGH-REM WASTE TRANSFERS, perform an evaluation to identify ARM locations and alarm requirements for above-ground transfer lines and exposed transfer lines in the excavations in the TRANSFER PATH per Reference 13.
2. Ensure that the ARM locations and alarm requirements identified by the evaluation above are included in the transfer procedure. The identified ARMs shall comply with LCO 3.7.9 requirements.

#### 4.23 Waste Tank Inhalation Dose Potential (TSR 5.8.2.51)

##### ATTRIBUTE REQUIREMENT:

Programmatic controls shall be established to ensure that the waste tank inhalation dose potentials are within the values analyzed in the DSA.

DSA Section 3.4.1.5.1 source term inputs and assumptions listed several waste streams that are used throughout the DSA to signify the Material At Risk (MAR) per unit volume basis. This section listed bounding sludge slurry waste stream inhalation dose potential as up to  $1.5\text{E}+09$  rem/gallon and Slurried Type IV Tank waste stream inhalation dose potential as up to  $1.0\text{E}+07$  rem/gallon.

Reference 8 documented that none of the H-Area waste tanks exceeded the bounding sludge slurry inhalation dose potential based on current tank status. However, it demonstrated that for tanks where the sludge mass exceeds  $4.36\text{E}+04$  kg and the sludge dose potential exceeds  $9.0\text{E}+05$  rem/gram, the resultant slurry may exceed the analyzed inhalation dose potential of  $1.5\text{E}+09$  rem/gallon. Therefore, prior to initiating sludge mixing activities within tanks meeting this criteria, an evaluation shall be performed to verify that the resultant slurry will not exceed inhalation dose potential of  $1.5\text{E}+09$  rem/gallon.

Also Reference 9 documented that of all the Type IV tanks, only Tanks 21 and 22 have the potential to exceed the analyzed inhalation dose potential for Type IV tank slurry of  $1.0\text{E}+07$  rem/gallon. Therefore, prior to initiating sludge mixing activities within Tank 21 or Tank 22, an evaluation shall be performed to verify that the resultant slurry will not exceed an inhalation dose potential of  $1.0\text{E}+07$  rem/gallon.

This administrative control is applicable only when slurrying H-Area sludge tanks.

##### IMPLEMENTATION:

An evaluation shall be performed to verify that the inhalation dose potential does not exceed the bounding sludge slurry inhalation dose potential of  $1.5\text{E}+09$  rem/gallon when the sludge mass exceeds  $4.36\text{E}+04$  kg AND sludge dose potential exceeds  $9.0\text{E}+05$  rem/gram prior to initiating the sludge mixing (Reference 8). Prior to initiating the sludge mixing in Tanks 21 and 22, an evaluation shall be performed to verify that the slurry inhalation dose potential does not exceed the Type IV tank slurry inhalation dose potential or  $1.0\text{E}+07$  rem/gallon (Reference 9).

Implementation Items:

1. Prior to initiating sludge mixing activities in a H-Area waste tank, determine if sludge mass AND the sludge dose potential is greater than 4.36E04 kg AND 9.0E+05 rem/gram respectively.
2. If sludge mass AND the sludge dose potential is greater than 4.36E+04 kg AND 9.0E+05 rem/gram respectively, perform an evaluation to verify that the resultant inhalation dose potential will not exceed 1.5E+09 rem/gallon prior to initiating the sludge mixing in the tank.
3. Prior to initiating sludge mixing activities in Tanks 21 and 22, perform an evaluation to verify that resultant inhalation dose potential will not exceed 1.0E+07 rem/gallon.

4.24 Critical Lift Program (TSR 5.8.2.5)

Refer to Maintenance Procedure HLWM-16004 (Reference 18) for transfer related requirements.

4.25 Corrosion Control Program (TSR 5.8.2.13)

Refer to the Corrosion Control Program PDD (Reference 17) Compensatory Measures and Monitoring Frequencies delineated in Section 5.0 for transfer related requirements.

4.26 Traffic Control Program (TSR 5.8.2.14)

Refer to the Traffic Control Program PDD (Reference 24) Section 5.0 for transfer related requirements.

4.27 Waste Acceptance Criteria Program (TSR 5.8.2.15)

The Waste Acceptance Criteria Program shall ensure that the composition of waste streams received into the FACILITY is within analyzed limits. Transfer of waste from CST Facilities to other facilities shall meet the receiving facility Safety Basis.

The Waste Acceptance Criteria (WAC) and Waste Compliance Plan (WCP) programs as outlined in the 1S Manual shall be used to meet this requirement. The ERD will shall list the approved waste streams that can be received into the FACILITY based on WAC and WCP programs.

Implementation Item:

1. Transfer procedure shall verify that waste streams from non-CSTF facilities are approved per the ERD (Reference 29) prior to the transfer.

4.28 Sludge Carryover Minimization Program (TSR 5.8.2.19)

Refer to the Sludge Carryover Minimization Program PDD (Reference 20) Section 4.0 for transfer related requirements.

4.29 Flammable Vapor Sampling Program (TSR 5.8.2.22)

Refer to TSR Section 5.8.2.22 for transfer related requirements. The sampling frequency shall be as prescribed in Reference 27.

4.30 Transfers from Waste Tank Annuli (TSR 5.8.2.23)

Refer to TSR Section 5.8.2.23 for transfer related requirements.

4.31 Evaporator Feed Qualification Program (TSR 5.8.2.25)

Programmatic controls shall be established to ensure that the composition of waste streams received into the evaporator feed tanks is within analyzed limits prior to transfer to the evaporator pot. The program shall address such items as inhalation dose potential and hydrogen generation rate.

Refer to TSR Section 5.8.2.25 and Evaporator Feed Qualification Program PDD (Reference 15) for transfer related requirements.

4.32 Waste Tank Quiescent Time Program (TSR 5.8.2.28)

Refer to TSR Section 5.8.2.28 and the CSTF Flammability Control Program PDD (Reference 14) Section 5.2 for transfer related requirements.

4.33 Salt Dissolution/Interstitial Liquid Removal Program (TSR 5.8.2.30)

Refer to the CSTF Flammability Control Program PDD (Reference 14) Section 5.4 and TSR Section 5.8.2.30 for transfer related requirements.

4.34 Waste Characterization System Control Program (TSR 5.8.2.32)

Refer to the Waste Characterization System Control Program PDD (Reference 25) for transfer related requirements.

Implementation Item:

1. Transfer procedures shall ensure that the final levels for transfer and receipt tanks and final transfer volume are transmitted to Waste Characterization Group after the transfer. This information will be entered in to the WCS as post-transfer data.

4.35 Waste Tank Floating Control Program (TSR 5.8.2.34)

Refer to TSR Section 5.8.2.34 for transfer related requirements.

4.36 Pump Tank Backup Ventilation System Systems Program (TSR 5.8.2.37)

Refer to TSR Section 5.8.2.37 for transfer related requirements.

4.37 Liquid Addition Program (TSR 5.8.2.40)

Refer to TSR Section 5.8.2.40 for transfer related requirements.

4.38 Prohibited Operations (TSR 5.8.2.43)

Refer to TSR Section 5.8.2.43 for transfer related requirements.

4.39 Tank Fill Limits (TSR 5.8.2.44)

Refer to TSR Section 5.8.2.44 for transfer related requirements.

4.40 Transfers to DWPF and Saltstone (TSR 5.8.2.47)

Refer to TSR Section 5.8.2.47 for transfer related requirements.

4.41 Tank 48 Unauthorized Operations (TSR 5.8.2.49)

Refer to TSR Section 5.8.2.49 for transfer related requirements.

4.42 Ventilation Systems Performance Monitoring (TSR 5.8.2.50)

Refer to TSR Section 5.8.2.50 and DSA Section 5.5.4.2.47 for transfer related requirements.

4.43 Interface With Defense Waste Processing Facility (DSA Section 5.7.2.1)

Refer to DSA Section 5.7.2.1 for transfer related requirements for Tank 40 or Tank 51 activities.

4.44 Interface Effluent Treatment Facility (DSA Section 5.7.2.3)

Refer to DSA Section 5.7.2.3 for transfer related requirements.

4.45 DSA Section 3.4.2.9.3

The source term analysis described in DSA Section 3.4.2.9.3 assumed that the secondary containments are closed (i.e., cell covers are in place, but small openings such as access or inspection ports may be open) when a WASTE TRANSFER is in progress through the secondary containment.

Implementation Item:

1. Transfer procedures verify that the cell covers are in place for all the secondary containments in the TRANSFER PATH prior to the WASTE TRANSFER. Cell covers are not required for the secondary containments downstream of the first sound isolation point.

#### 4.46 DSA Chapter 6: Prevention of Inadvertent Criticality

Refer to DSA Section 6.5.2 for transfer related requirements.

## 5.0 OTHER COMMITMENTS RELATED TO WASTE TRANSFERS

The following are other commitments related to waste transfers from various documents. These commitments shall be implemented.

### 5.1 FFA Commitments (Reference 28)

1. Secondary Containment: Tank Systems will be operated with a leak detection system so that it shall detect the failure of either the primary or secondary containment structure of the presence of any leak of hazardous or radioactive constituents, hazardous substances, or accumulated liquid in the secondary containment system within 24 hours or the earliest practicable time, if DOE can demonstrate that the existing detection technology or site conditions would not allow detection of a leak within 24 hours. (FFA Section IX, Appendix B, C.1(c)).
2. Waste tanks Leak Detection and Containment: If the leak was to the environment, within 24 hours after detection of the leak, or if it is demonstrated that it is not possible, at the earliest practicable time, remove as much of the hazardous/radioactive substance as is necessary to prevent further release of hazardous or radioactive substances to the environment and to allow inspection and repair of the tank system(s) to be performed. (FFA Section IX, Appendix B, D.1(b)).
3. Waste tanks Leak Detection and Containment: If the leak was to a secondary containment systems, all accumulated materials shall be removed from the secondary containment systems within 24 hours or in as timely a manner as is possible to prevent harm to human health and the environment. (FFA Section IX, Appendix B, D.1(c)).

### 5.2 Wastewater Permit Commitments

1. Once waste removal begins on a tank with a leak or crack and the waste is removed to a level below the lowest known leak or crack, that level shall become the maximum operating level of the tank and shall not be exceeded unless the exceedance is a temporary result of the waste removal process. (Reference 3, Special Condition # 6)
2. No tank that leaks or has leaked shall be used for waste receipt without prior approval from DHEC. This condition does not apply to the necessary addition of waste for waste removal purposes. (Reference 3, Special Condition # 7)

3. Based on a review of the Tank Assessment Report, submitted as a requirement of the Federal Facilities Agreement (FFA), Section IX, DHEC has determined that the Type I tanks identified as tanks 2-8 are approvable as equivalent devices for secondary containment. The Type I tanks, however, should only be used for waste receipt when there is no suitably available volume in an approved Type III tank. Furthermore, if any Type I tank develops a leak, which exceeds the capacity of the 5-foot deep secondary containment pan, this approval shall be rescinded and no additional waste shall be directed to these Type I tanks. (Reference 3, Special Condition # 11)
4. Type IV tanks do not meet secondary containment requirements. Tanks 21-24H are fit for use as low level waste receipt tanks until their scheduled waste removal date. (Reference 3)
5. The following five transfer lines are permitted to be used:

HDB-5 to Tank 21 (Line 102E)      HDB-5 to Tank 22 (Line 103E)  
HDB-5 to Tank 23 (Line 101E)      HDB-5 to Tank 24 (Line 1825)  
Tank 14 to Tank 13 (Line 21E)

At the time of the Wastewater permit approval, the lines listed above did not meet the secondary containment (Reference 4). It was proposed that two lines (lines 1825 and 21E) would be decommissioned with the associated tank systems. The other three lines (101E, 102E, 103E) would be evaluated for need of repairing these lines for secondary containment requirements.

Since the permit approval, HDB-5 to Tanks 21 and 22 transfer lines (102E, 103E) have been modified to meet the secondary containment requirements. Also DHEC had been informed that HDB-5 to Tank 23 transfer line (101E) will not be modified and will be decommissioned with the associated tank systems. (Reference 4 and Electronic mail to DHEC from Chuck Hayes on 6/25/97)

6. The following two filtrate transfer lines do not meet secondary containment requirements:

Line FT-702A (M-M6-H-8213)  
Line FT-1104A (M-M6-H-8214)

These two transfer lines are required to be hydrostatic tested every two years to confirm no leakage exists. (Assessment Report Phase

I for ITP Treatment Facility). These lines are not in service since the ITP Filtrate Building is not in service and hydrostatic testing is not required per Environmental Compliance Group.

5.3 PAAA Commitments

1. Deleted.
2. Deleted.
3. Modify the waste transfer evaluation and approval procedure to include logic of the logic diagram from HLW-STE-2001-00406. (SIRIM Report SR-WSRC-HTANKW-2001-0029, Corrective Action 1). Implemented in the waste transfer evaluation and approval procedure.

5.4 Authorization Agreement (AA) Commitments (Reference 12)

1. Waste transfers into Type I and II Tanks are prohibited unless the transfers are used to retrieve the waste contained in Type I, II or IV Tanks.
2. Storage of In-Tank Precipitation process precipitate and supernate in Tank 49 is only permitted in the event of a leak in the primary of Tank 48 and following DOE approval of a Response Plan.

5.5 Best Management Practices (BMPs)

1. Area radiation monitoring with a local alarm shall be provided at the gang valve house during a jet waste transfer. This includes lift and lance gang valve operations for evaporator operations. Above-ground gang valves are used to route steam to transfer jets. Under normal conditions, the gang valve assembly does not contain waste. However, if steam flow through the gang valve is interrupted during a transfer, and the automatic air blow feature fails and the gang valve does not go to the maintenance position, waste can be sucked back into the gang valve assembly due to trapped collapsing steam. If this occurs, high radiation rates at the gang valve piping could result. The purpose of this monitoring is to provide personnel protection at locations where potentially high radiation rates can exist as a result of a waste transfer.
2. Deleted.
3. DWPF Qualified Sludge Feed Tank shall be isolated from the TRANSFER PATH by sound double valve isolation, a single leak-tested valve or a blank to prevent contamination of the qualified DWPF feed. Tank 40 Drain Valve Box Valve WTS-V-20 can not

be leak checked. However, this valve is seldom opened and several transfers were performed previously, which placed this valve in the TRANSFER PATH without any indication of leak by. Therefore, valve WTS-V-20 in Tank 40 Drain Valve Box need not be leak checked.

4. If the receiving or transfer tank, excluding evaporator recycle transfers, is a salt tank, identify in the transfer evaluation and approval procedure a requirement to initiate radiation surveys on purge HEPA housing of the transfer/receipt salt tank shiftily for the duration of the transfer. This BMP requirement is based on past experience with purge HEPA filters build-up during the salt tank transfers.
5. To prevent the HPFP from being a LEAK DETECTION LOCATION during a HIGH-REM WASTE TRANSFER using HPT-7 Pump 2, pneumatic valve WTS-FV-6953 (if seismically qualified for operability) shall be leak-tested or have a blank installed. This will preclude HIGH-REM material leakage into the HPFP sump, which would be transferred into FPT-1. Transferring HIGH-REM material into F-Tank Farm is prohibited.
6. Material balances shall be performed for pump tank transfers. For transfers like Canyon to pump tank (Continuous or batch), a single material balance at the end of the transfer is appropriate.

#### 5.6 DOE Manual 435.1-1 Commitments (Reference 33)

1. "Contingency Actions. The following requirements are in addition to those in Chapter I of this Manual.  
(1) Contingency Storage. For off-normal or emergency situations involving high-level waste storage or treatment, spare capacity with adequate capabilities shall be maintained to receive the largest volume of waste contained in any one storage vessel, pretreatment facility, or treatment facility. Tanks or other facilities that are designated for high-level waste contingency storage shall be maintained in an operational condition when waste is present and shall meet all the requirements of DOE O 435.1, Radioactive Waste Management, and this Manual." (DOEM435.1-1 Ch. 2-h.(1))

This commitment is implemented by the waste transfer approval process via the "Electronic Transfer Approval Form", OSR form 46-293.

6.0

References

1. WSRC-SA-2002-00007, Rev. 2, "Concentration, Storage, and Transfer Facilities Documented Safety Analysis", December 2003.
2. S-TSR-G-00001, Rev. 7, "Technical Safety Requirements, Concentration, Storage, and Transfer Facilities", December 2003.
3. SCDHEC Permit to Operate #17,424-IW, "F and H-Area High-Level Radioactive Waste Tank Farms", March 3, 1993.
4. ESH-FSS-92-0811, "Phase II Tank Assessment report for the F and H-Area High Level Radioactive Waste Tank Farms", November 30, 1992.
5. N-NCS-H-00121, "Nuclear Criticality Safety Evaluation: 242-16H Evaporator Restart", Rev. 4.
6. Deleted.
7. N-NCS-H-00132, "Nuclear Criticality Safety Evaluation: Tank 50 Valve Box Transfers", Rev. 0.
8. X-CLC-H-00305, "Requirements to Prevent Exceeding the CST 830 DSA Bounding Sludge Slurry Source Term in H-Area Waste Tanks", Rev.0.
9. X-CLC-G-00025, "Requirements to Prevent Exceeding the CST 830 DSA Bounding Slurried Type IV Tank Source Term in H-Area Waste Tanks", Rev. 0.
10. WSRC-TR-2002-00260, "Lower Source Terms for F-area Tanks", Rev. 1, by P. D. d'Entremont, J. K. Jeffrey, J. R. Hester, P. J. Hill, 7/24/2002.
11. Marks' Standard Handbook for Mechanical Engineers, 10<sup>th</sup> Edition.
12. WSRC-RP-2001-00154, "U.S. Department of Energy Savannah River Operations Office and Westinghouse Savannah River Company Authorization for the Concentration, Storage, and Transfer Facilities (CSTF)", Rev. 5.
13. WSRC-TR-2003-00069, "Area Radiation Monitors, Adequacy and Strategy for Leak Detection".
14. WSRC-TR-2003-00087, "Tank Farm Flammability Control Program Description Document".
15. WSRC-TR-2003-00055, "Evaporator Feed Qualification Program Description Document".
16. WSRC-TR-2003-00090, "Sampling Methodology for DSA Administrative Programs".

17. WSRC-TR-2002-00327, "Tank Farm Corrosion Control Program Description Document".
18. Deleted.
19. HLWM 16004, "Crane Operations in Liquid Waste Disposition Project Area (U)".
20. WSRC-TR-2003-00089, "CSTF Sludge Carryover Minimization Program Description Document".
21. CBU-PSP-2003-00001, "WM-AP-3105, Waste Transfer Procedure Guide Review and Recommendation", March 5, 2003.
22. Waste Acceptance Criteria Manual, WSRC Procedure Manual 1S, Westinghouse Savannah River Company, Procedure WAC 4.02 F/H Effluent Treatment Facility Waste Acceptance Criteria.
23. WSMS-LIC-03-00156, "Inhalation Dose Potential of Pump Pit Sump Contents", Rev. 0, October 22, 2003.
24. WSRC-TR-2002-00376, "CSTF Traffic Control Program Description Document".
25. WSRC-TR-2003-00048, "Waste Characterization System Program Description Document".
26. WSRC-TR-2003-00157, "A Graded Approach to Salt-Out Evaluations for Waste Transfers in the Tank Farm", J. K. Jeffrey.
27. HLW-STE-2002-00417, "CST Transfer Line Jacket/Encasement Vapor Space Sampling Frequency", Greg Arthur.
28. WSRC-OS-94-42 (Administrative Document Number 89-05-FF), "Federal Facility Agreement for the Savannah River Site".
29. N-ESR-G-00001, "High Level Waste Emergency Response Data and Waste Tank Data".
30. M-ESR-S-00015, "An Evaluation of Water Hammer Occurrence in the Tank Farm Waste Transfer System".
31. WSRC-RP-93-900-TL, "Recommended Flow Rates for Flushing the Hydrogard Sampler".
32. WSRC-RP-93-800, "Flushing the H-S Inter-area Transfer Lines".
33. DOE Manual 435.1-1, "Radioactive Waste Management Manual, Chg. 1".
34. X-CLC-G-00062, "Low Rem Transfer Table", Rev. 0.

## ATTACHMENT-1

### LEAK DETECTION LOCATIONS

The definition of LEAK DETECTION LOCATION in the TSRs ended up being fairly simple. LEAK DETECTION LOCATIONS support waste primary containment SSCs (e.g., waste tanks, pump tanks, transfer lines). A LEAK DETECTION LOCATION is any structure or component (e.g., sump, leak detection box) credited with accumulating sufficient liquid waste that escapes primary containment to allow observation (e.g., by leak detection instruments or other methods). So any single waste primary containment may have one or more LEAK DETECTION LOCATIONS associated with it. These will be the LEAK DETECTION LOCATIONS for that primary waste containment regardless of the status of the contents of the primary waste containment (e.g., pump tank empty or full, transfer line actively transferring or drained).

LEAK DETECTION LOCATIONS have Safety Basis requirements placed on them from several drivers. These drivers include LCOs and Administrative Controls. The applicability of several LCOs is dependent on the MODE of Transfer Lines for which certain LEAK DETECTION LOCATIONS are credited. Some of these LCOs are applicable in All MODES and others are applicable only in HIGH-REM TRANSFER MODE. The most straight-forward way to think of how these LCOs will become involved with the conduct of actual waste transfers in the facility is to first consider which transfer line segments (including jumpers) are associated with a given LEAK DETECTION LOCATION. After the correlation of line segments with LEAK DETECTION LOCATIONS is known, determining which LEAK DETECTION LOCATIONS are associated with a given transfer through the LCOs is simply a matter of determining all the line segments along the TRANSFER PATH (up to the first sound isolation point) and listing the LEAK DETECTION LOCATIONS for all those line segments.

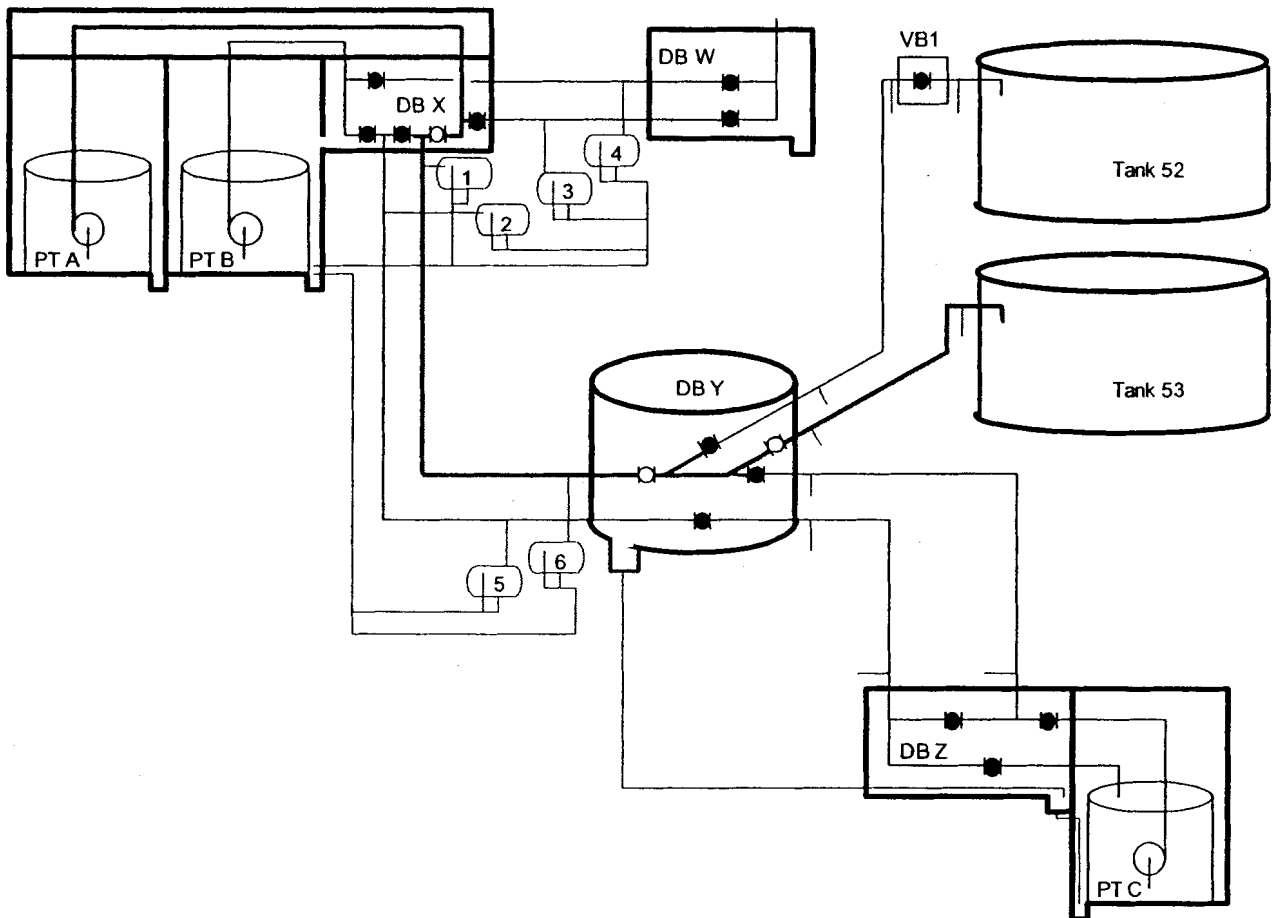
In addition to the requirements of the LCOs, the Transfer Control Program places requirements on LEAK DETECTION LOCATIONS. TSR AC 5.8.2.21.c requires monitoring of waste transfers to detect transfer events. The frequency and method (e.g., material balances, level/leak monitoring) of monitoring for a transfer and the required monitoring locations (including consideration of those past the first sound isolation point) shall be determined on an individual basis. So, although the LCOs only place requirements on LEAK DETECTION LOCATIONS along the TRANSFER PATH, some level monitoring of certain LEAK DETECTION LOCATIONS associated with line segments off the TRANSFER PATH may be needed to properly implement the Administrative Control (e.g., sumps that are LEAK DETECTION LOCATIONS for transfer lines / jumpers that are between the first sound isolation point and the second sound isolation point).

LDBs/MLDBs/LPSs that are LEAK DETECTION LOCATIONS for line segments between the first and second sound isolation points are typically excluded from the monitoring requirements of TSR AC 5.8.2.21.c. The exclusion of these LDBs/MLDBs/LPSs is in part based on the high reliability of the welded core pipe that these LEAK DETECTION LOCATIONS support combined with the fact that the transfer is not expected to pressurize the line segments downstream the first sound isolation point.

The annulus for a waste tank is a LEAK DETECTION LOCATION for the transfer lines that pass through the annulus. This is because the portions of the transfer line jacket that pass through the annulus are not credited with being leak-tight. Waste tank annuli that are LEAK DETECTION LOCATIONS for transfer lines on a TRANSFER PATH are typically monitored as part of TSR AC 5.8.2.21.c. Waste tank annuli that are LEAK DETECTION LOCATIONS for line segments beyond the first sound isolation point of a TRANSFER PATH are typically excluded from the monitoring requirements of TSR AC 5.8.2.21.c. The exclusion of these annuli is based in part on the high reliability of the welded core pipe that these LEAK DETECTION LOCATIONS support combined with the fact that the transfer is not expected to pressurize the line segments downstream of the first sound isolation point.

### Examples:

Consider the TRANSFER PATH from Pump Tank A to Tank 53 shown in the simplified diagram below.



In this diagram, Diversion Box X has a large credited drain from the box into Pump Pit B. Therefore Diversion Box X is not a credited LEAK DETECTION LOCATION (waste cannot accumulate there). Diversion Boxes Y and Z also have drains, but these drains are too small to ensure that waste will not accumulate. Diversion Boxes Y and Z also have no weirs or similar devices to ensure that leakage into these boxes will be detected before the liquid exits the box.

The TRANSFER PATH is shown in dark solid line in the above diagram. The LEAK DETECTION LOCATIONS for all the line segments/jumpers along the TRANSFER PATH are: Pump Pits A, B, and C, Diversion Boxes Y and Z, LDBs 1 and 6 (and two more LDBs between DB Y and Tank 53 that are not fully shown or identified). Note that the only reason Diversion Box Z and Pump Pit C are LEAK DETECTION LOCATIONS for line segments/jumpers on the TRANSFER PATH is because of the “cascading sump” issue from Diversion Box Y.

LCO requirements (e.g., sump level, conductivity probe operability, or ventilation) typically do not vary based on whether or not a transfer is in progress. LCO requirements are applied based on the MODE the associated PROCESS AREAS are in. Transfer Lines only have two MODES – OPERATION and HIGH-REM TRANSFER. LCOs of concern typically are applicable to Transfer Lines in either All MODES or only during HIGH-REM TRANSFER MODE. Some of these LCOs also apply to Pump Tanks, which have different MODES from Transfer Lines.

Therefore, even if the transfer from Pump Tank A to Tank 53 was a HIGH-REM TRANSFER, the conductivity probe in Diversion Box W would not be required to be operable by LCO 3.7.3 as long as all the Transfer Lines for which Diversion Box W was a LEAK DETECTION LOCATION remained in OPERATION MODE. The conductivity probe in Diversion Box Y would be required to be operable because the Transfer Lines and jumpers in DB-Y that are on the TRANSFER PATH would have to be in HIGH-REM TRANSFER MODE to support the transfer. The conductivity probe in Diversion Box Z would also be required to be operable not because any Transfer Lines within the diversion box were in HIGH-REM WASTE TRANSFER MODE, but because of the cascading sump issue from DB-Y.

LCO 3.7.4 for Valve Boxes, Drain Valve Boxes, and the HPFP ends up applying differently to this scenario than the Diversion Box LCOs. Even though the TRANSFER PATH from Pump Tank A to Tank 53 does not include the Transfer Line through Valve Box 1 (TRANSFER PATH stops at first closed valve in Diversion Box Y), if the closed valve in Diversion Box Y is not leak checked the Transfer Line into Valve Box 1 is required to be in HIGH-REM TRANSFER MODE (even though the line segment is not on the TRANSFER PATH of the HIGH-REM WASTE TRANSFER). Thus, if this were the case, the conductivity probes in the LDBs between DBY and VB1 would be required to be operable per LCO 3.7.4. Refer to TSR Section 1.6.4 Item 3 for Transfer Lines in OPERATION MODE.

Administrative Controls are applicable to Waste Transfers separately from LCO requirements. TSR AC 5.8.2.21.c requires monitoring of waste transfers to detect transfer events. This typically requires monitoring not only the sending and receiving tank levels, but also appropriate monitoring of tanks that could potentially receive flow from transfer events. It also requires appropriate monitoring of LEAK DETECTION LOCATIONS – both those along the TRANSFER PATH and the ones associated with Transfer Line segments outside the TRANSFER PATH where transfer events could occur.

Implementing TSR AC 5.8.2.21.c requires monitoring waste tanks, pump tanks, and LEAK DETECTION LOCATIONS for all transfer line segments along the TRANSFER PATH. Additionally, monitoring waste tanks and pump tanks isolated from the TRANSFER PATH by a single non-leak checked valve and LEAK DETECTION LOCATIONS (excluding LDBs/MLDBs/LPSs and waste tank annuli) for transfer line segments isolated from the TRANSFER PATH by a single non-leak checked valve is typically required. Exceptions may be taken to this standard approach of implementing TSR AC 5.8.2.21.c, but they must be justified on a case-by-case basis.

So even though a LEAK DETECTION LOCATION may not have LCO-driven leak detection instrument requirements or level requirements for a transfer, the TSR Administrative Control Program may determine that certain monitoring requirements are needed in those LEAK DETECTION LOCATIONS during the transfer.